Diamond Wire Saw
User's Manual

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EU DECLARATION OF CONFORMITY
WITH
COUNCIL DIRECTIVE 2006/42/EC

Issue Details:	Date: 09/19/2014	Place: EH Wachs, Lincolnshire, Il, USA
Directives:	Machinery Safety Directive 2006/42/EC	
Conforming Machinery:	Diamond Wire Machines 10-010-5xx (DWS) 10-010-5xx-ROV (DWDWS)	
Model Number:	10-010-5xx 10-010-5xx-ROV	
Serial Number:		
Manufacturer:	Wachs Subsea LLC 15331 Vantage Pkwy E Houston, TX, 77032	
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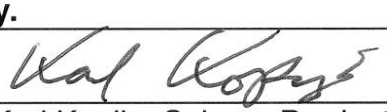
Harmonised Standards & Other Technical Standards/Specifications Applied or Referenced:	EN ISO 12100:2010, EN ISO 13849-1-2, EN 61310-1-2:2008, EN ISO 4413:2010, ISO 6149-1-2-3, ISO 11688-1, ISO 19902	
Provisions with which Conformity is Declared:	Essential Health and Safety Requirements of Annex 1 of the Machinery Directive	
We hereby certify that the machinery described above conforms to the provisions of Council Directive 2006/42/EC on the approximation of the laws of the Member States relating to the safety of machinery.		
Signed:		
Signatory:	Karl Kopija, Subsea Product Manager	

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Chapter 1

About the Diamond Wire Saw

In This Chapter

PURPOSE OF THIS MANUAL

HOW TO USE THE MANUAL

SYMBOLS AND WARNINGS

MANUAL UPDATES AND REVISION TRACKING

EQUIPMENT DESCRIPTION

OPERATING ENVELOPE

PURPOSE OF THIS MANUAL

This manual explains how to operate and maintain the diamond wire saw. It includes instructions for set-up, operation, and maintenance. It also contains parts lists, diagrams, and service information to help you order replacement parts and perform user-serviceable repairs.

Before operating the diamond wire saw, you should read through this manual and become familiar with all instructions.

HOW TO USE THE MANUAL

This manual is organized to help you quickly find the information you need. Each chapter describes a specific topic on using or maintaining your equipment.

Each page is designed with two columns. This large column on the inside of the page contains instructions and illustrations. Use these instructions to operate and maintain the equipment.

The narrower column on the outside contains additional information such as warnings, special notes, and definitions. Refer to it for safety notes and other information.

Throughout this manual, refer to this column for warnings, cautions, and notices with supplementary information.

SYMBOLS AND WARNINGS

The following symbols are used throughout this manual to indicate special notes and warnings. They appear in the outside column of the page, next to the section they refer to. Make sure you understand what each symbol means, and follow all instructions for cautions and warnings.

WARNING

A WARNING alert with the safety alert symbol indicates a potentially hazardous situation that **could** result in **serious injury or death**.

CAUTION

A CAUTION alert with the safety alert symbol indicates a potentially hazardous situation that **could** result in **minor or moderate injury**.

CAUTION

A CAUTION alert with the damage alert symbol indicates a situation that **will** result in **damage to the equipment**.

IMPORTANT

An IMPORTANT alert with the damage alert symbol indicates a situation that **may** result in **damage to the equipment**.

This is the **safety alert symbol**. It is used to alert you to **potential personal injury hazards**. Obey all safety messages that follow this symbol to avoid possible injury or death.

This is the **equipment damage alert symbol**. It is used to alert you to **potential equipment damage situations**. Obey all messages that follow this symbol to avoid damaging the equipment or workpiece on which it is operating.

NOTE

This symbol indicates a user note. **Notes** provide additional information to supplement the instructions, or tips for easier operation.

NOTE

A NOTE provides supplementary information or operating tips.

MANUAL UPDATES AND REVISION TRACKING

Occasionally, we will update manuals with improved operation or maintenance procedures, or with corrections if necessary. When a manual is revised, we will update the revision history on the title page.

You may have factory service or upgrades performed on the equipment. If this service changes any technical data or operation and maintenance procedures, we will include a revised manual when we return the equipment to you.

Current versions of Wachs Subsea LLC Company manuals are also available in PDF format. You can request an electronic copy of this manual by emailing customer service at sales@ehwachs.com.

EQUIPMENT DESCRIPTION

The diamond wire saw is designed to cut submerged pipe of varying materials and thicknesses. The machine operates on hydraulic power, and is controlled remotely using the Wachs universal control panel (UCP).

The saw uses a continuous-loop diamond cutting wire and a hydraulic feed system that advances the cutting wire through the pipe. Using a wire rather than a blade provides more reliable cutting on varied pipe materials, and helps avoid binding of the cutting mechanism if the pipe bends and pinches while the saw is engaged.

The diamond wire saw required constant cooling of the wire during cutting. The machine is specifically designed for subsea or other underwater cutting applications, but it can be used for non-submerged uses if adequate coolant is applied to the wire. The machine can be supplied with customized cooling spray attachments that use tap water or other available coolant.

The diamond wire saw has three hydraulic drive circuits:

- Cutting drive: operates the drive wheel that drives the cutting wire.
- Feed drive: operates the bow holding the wire drive system, to feed the wire through the pipe and retract the bow when finished cutting.
- Clamp drive: operates the clamping arms that secure the machine to the pipe during cutting.

Separate controls and gauges for each circuit are provided on the UCP, described later in this chapter.

Diamond Wire Saw Models

NOTE

The model name indicates the pipe size capacity. The first two digits are the largest pipe, and the second pair of digits is the smallest. For example, the WS-3616 saw will cut pipes from 16" to 36" (406 to 914 mm) O.D.

Various wire saw models are available, each designed to cut a range of pipe sizes. The only significant difference in the models is size; all operate in a similar manner. The following table lists the models and capacities.

DWS models are the standard configuration, for operation in any environment. DWDWS (Deep Water Diamond Wire Saw) models are designed for subsea operation, with buoyancy for easy maneuverability.

Table 1: Diamond Wire Saw Models

Model	Min. Pipe Capacity	Max. Pipe Capacity
DWS-1604/DWDWS-1604	4" (102 mm)	16" (406 mm)
DWS-3012/DWDWS-3012	12" (305 mm)	30" (762 mm)
DWS-3616/DWDWS-3616	16" (406 mm)	36" (914 mm)
DWS-5230/DWDWS-5230	30" (762 mm)	52" (1321 mm)
DWS-8460/DWDWS-8460	60" (1524 mm)	84" (2133 mm)

Hydraulic Power Requirements

All models except the DWS-8460/DWDWS-8460 require a hydraulic power unit capable of 3000 psi (207 bar) pressure with 28-30 gpm (106-114 l/m) flow.

DWS-8460/DWDWS-8460 models require a hydraulic power unit capable of 2800 psi (193 bar) pressure with 35-40 gpm (132-151 l/m) flow.

Cutting Wire Drive System

The cutting wire drive system consists of four wheels mounted on the bow of the machine. Figure 1-1 illustrates the drive system components.

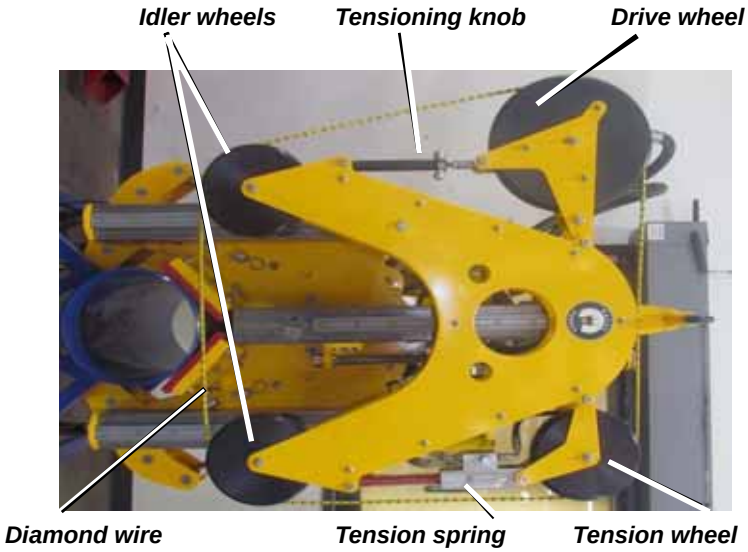


Figure 1-1. The photo shows the cutting wire drive system components.

The drive wheel is operated by the hydraulic drive motor. It is mounted on a pivoting fixture used to adjust the tension of the wire. The tension is set using a knob on the fixture, which also positions the wheel for installing and removing the cutting wire.

The tension wheel is on a pivoting, spring-loaded fixture that maintains wire tension. The idler wheels are fixed at the bottom of the bow where the cutting wire engages the pipe.

The wire is a custom-made loop for the size of the saw. Spare wires can be ordered from Wachs Subsea LLC.

Feed System

A feed drive mechanism on the main frame of the machine drives the bow and cutting system up and down to perform the cut and retract the bow after cutting. The bow rides on three feed rails and is driven by a feed screw in the center of the frame. Figure 1-2 and Figure 1-3 show the main feed system components.

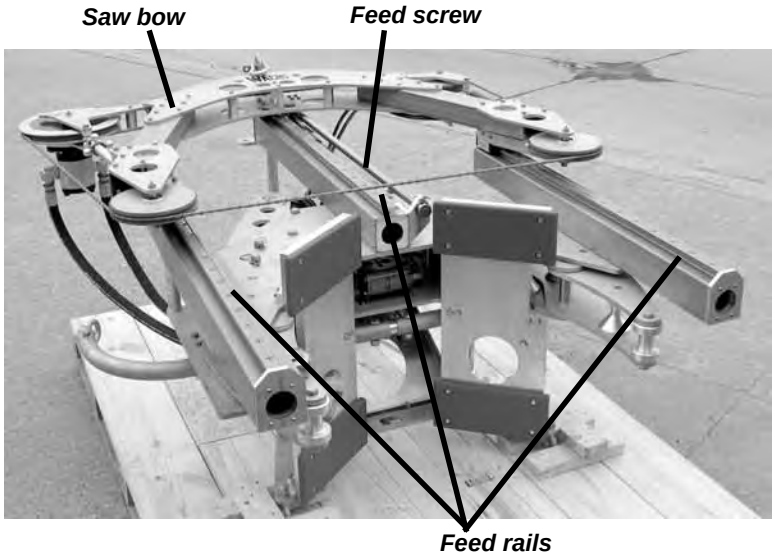


Figure 1-2. The saw bow moves on three feed rails on the frame. The feed screw along the center rail drives the bow.

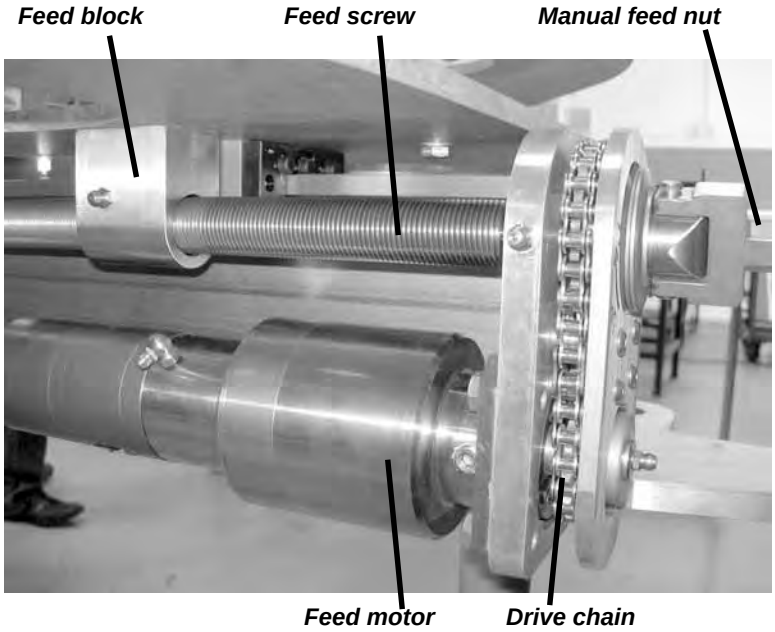


Figure 1-3. The feed system components are shown. The feed block is attached to the saw bow.

The top of the feed screw has a drive nut to allow the feed to be operated manually, and a clutch in the top coupling disengages the feed screw if the feed drive jams or reaches the end of travel.

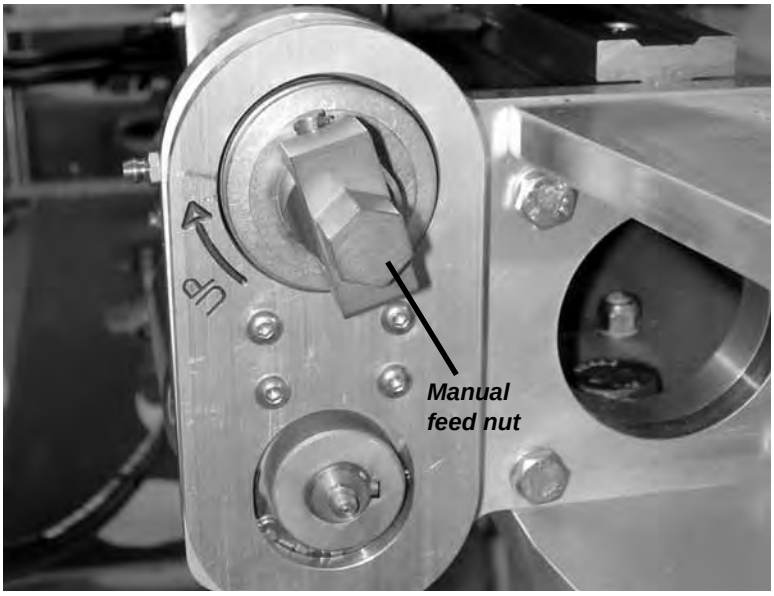


Figure 1-4. Use the manual feed nut to move the saw bow if it cannot be operated using hydraulic power. Turn the nut clockwise to retract the bow away from the workpiece.

The feed system has a self-adjusting speed control feature. A hydraulic actuator on the tension wheel fixture measures the deflection of the wire as it cuts. If the feed speed is too fast, the increased wire deflection trips the actuator, which slows down the feed rate. This allows the cutting action of the wire to catch up. At maximum deflection of the wire, the actuator will stop the feed motion for as long as necessary.

Figure 1-5. The actuator controls the feed rate by measuring the deflection of the cutting wire.

Clamping System

An adjustable clamping system allows you to configure the machine for pipe sizes within each model's range. The two clamping arms are attached to the main frame with two-pronged forked pins that are removable to reposition the arms.

The clamping arms are engaged by hydraulic cylinders mounted to the frame. When the cylinder rods are extended, the clamps pivot inward to grip the underside of the pipe and hold the machine securely to it. Figure 1-6 illustrates the clamping operation.

See the end of this chapter for drawings that illustrate clamp position settings for the range of each wire saw model.

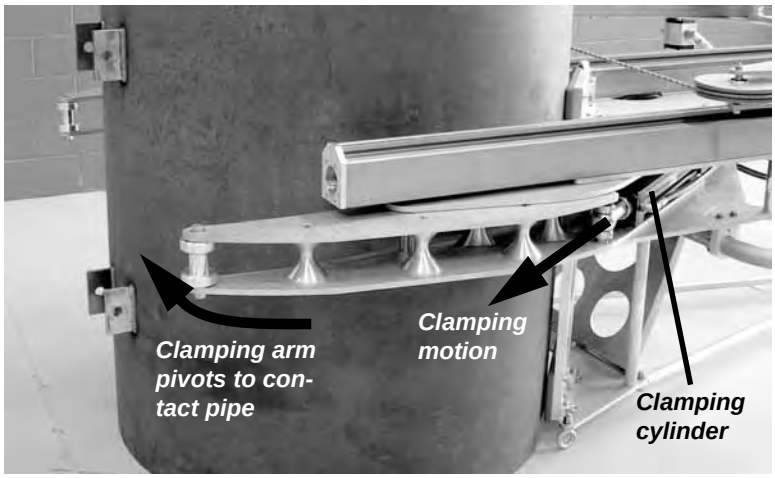


Figure 1-6. The photo shows the wire saw in position for clamping on a test workpiece. When the hydraulic cylinder is extended, the clamp arm pivots and closes on the pipe. Both clamping arms operate together.

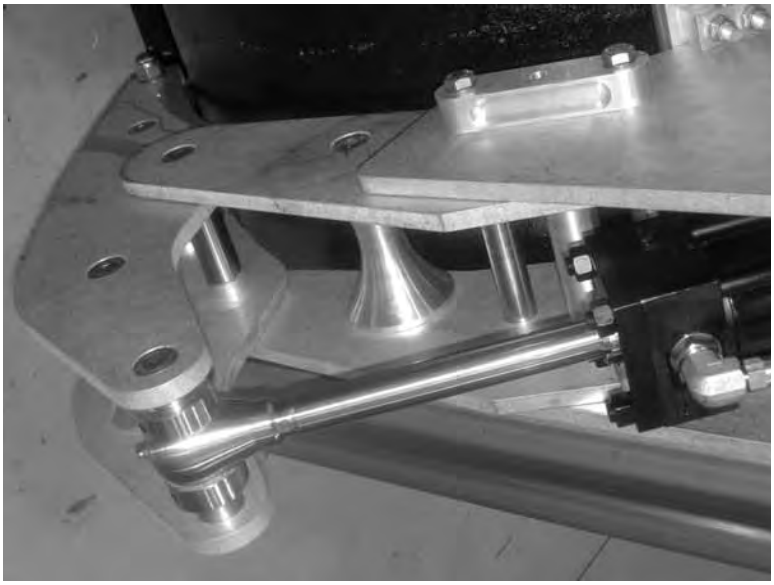


Figure 1-7. The photo shows the clamping cylinder extended and the clamp arm secured against the pipe.

The frame of the machine has clamp shoes attached that the machine rests upon when installed on the pipe. These shoes are made of a compressible composite material that deforms slightly under pressure to create a secure, slip-free grip on the pipe when the machine is clamped.

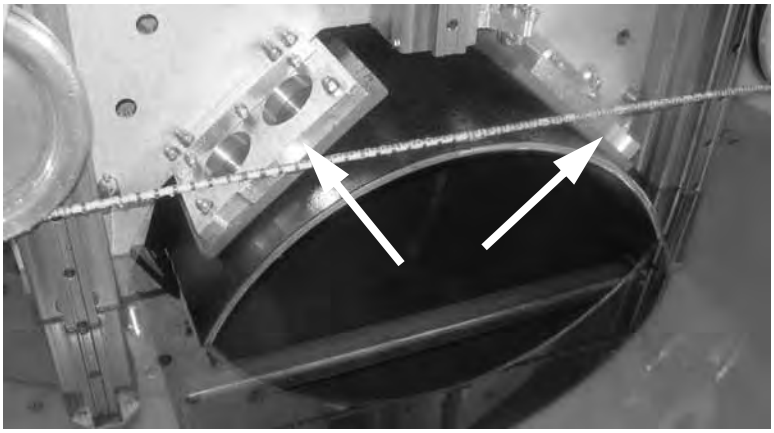


Figure 1-8. The front mounting shoes are shown.

Universal Control Panel (UCP)

Figure 1-9 illustrates the controls used to operate the subsea wire saw. Chapter 3 includes detailed instructions.

NOTE

For CE compliance, the DWS must be operated using a Wachs Subsea UCP.

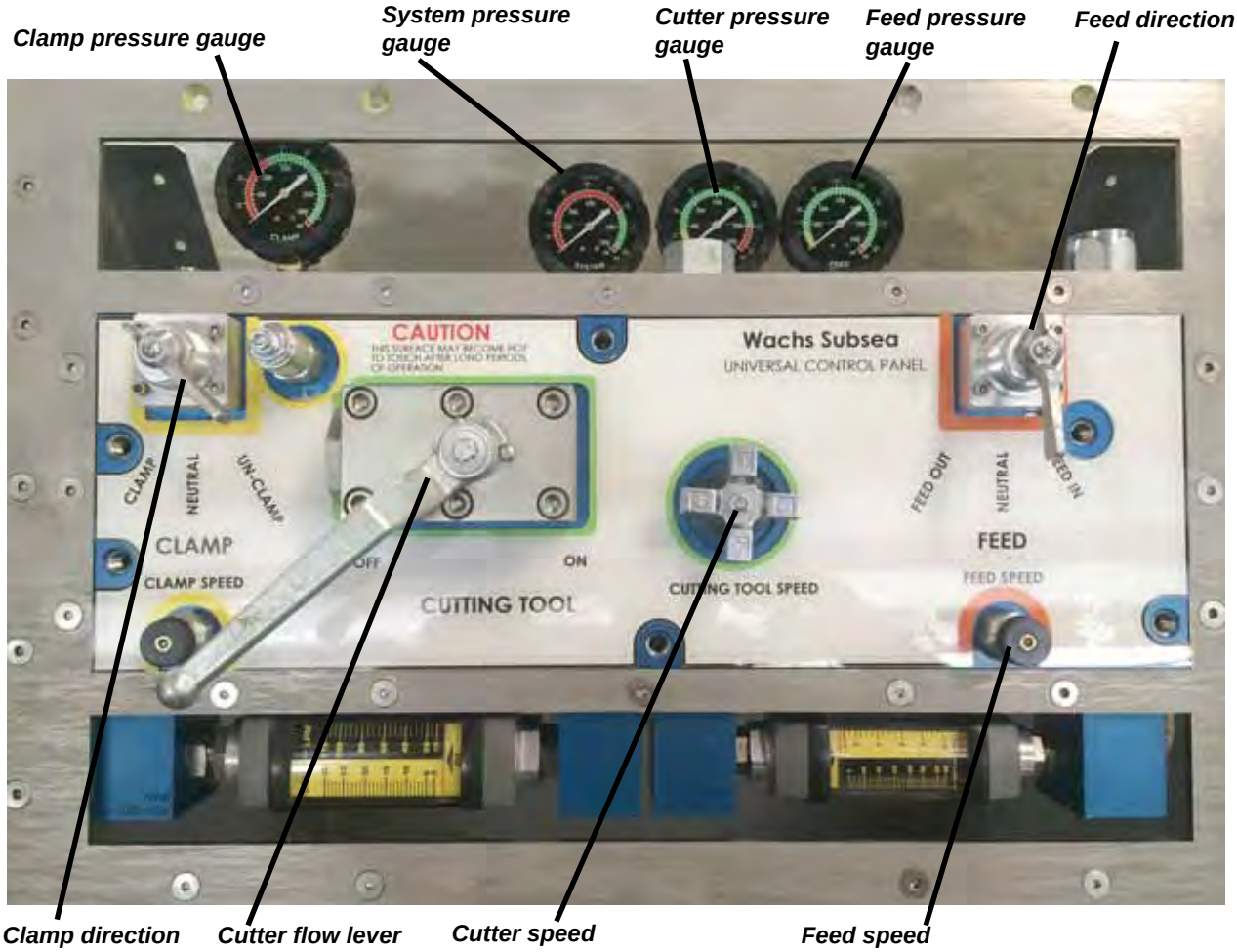


Figure 1-9. The photo illustrates the controls on the universal control panel. (Some UCP models have a different arrangement; see labeling on the UCP.)

Rigging the Machine

Refer to the rigging drawings on the following pages.

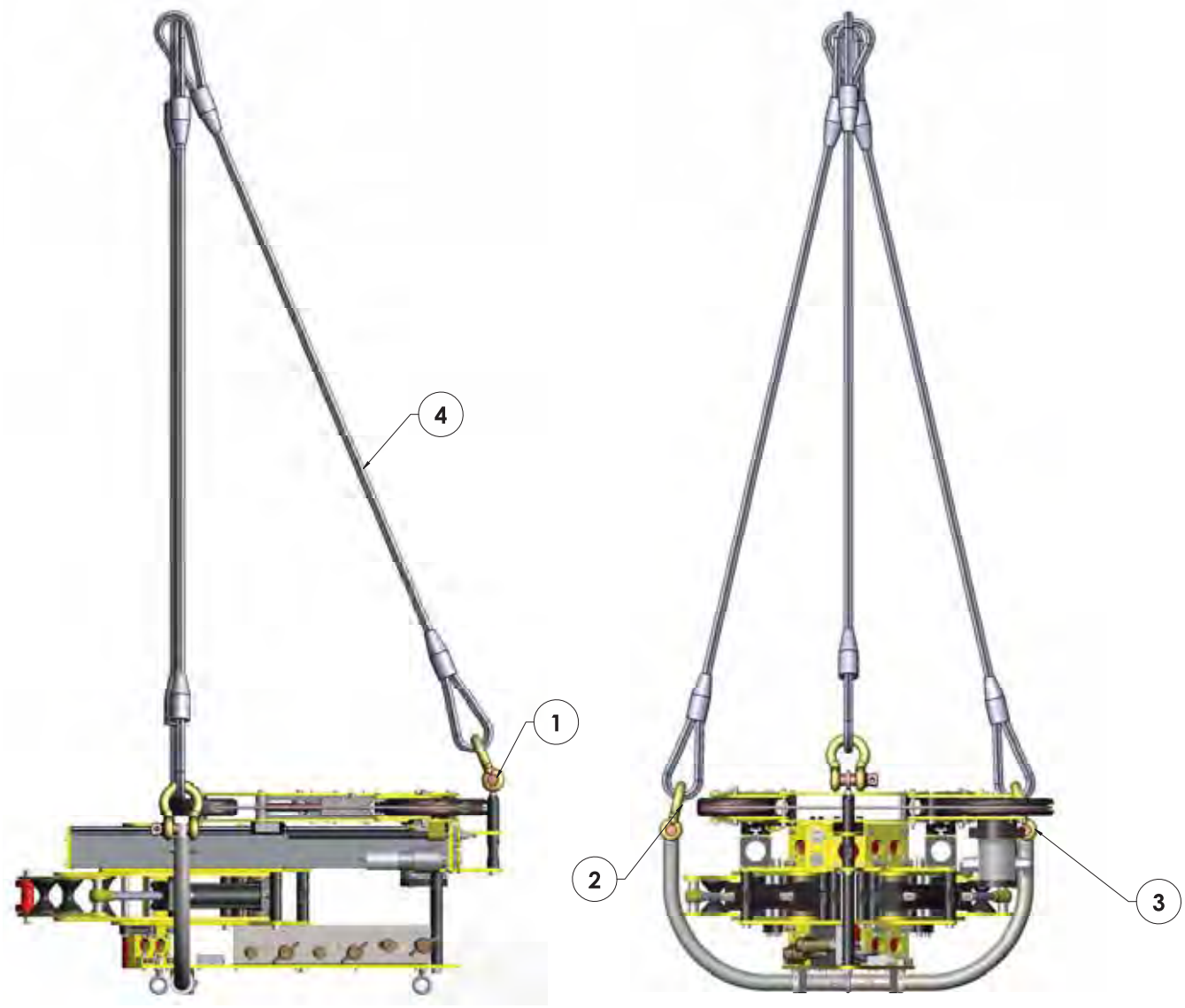

4
1
2
3
To position the machine horizontally
attach shackles to the two lift bar bosses (2 and 3)
and the front boss on top (1)
Changing the rigging lengths of (4) can result in an
infinite number of angles

Figure 1-10. The diagram illustrates rigging the DWS in a horizontal orientation.

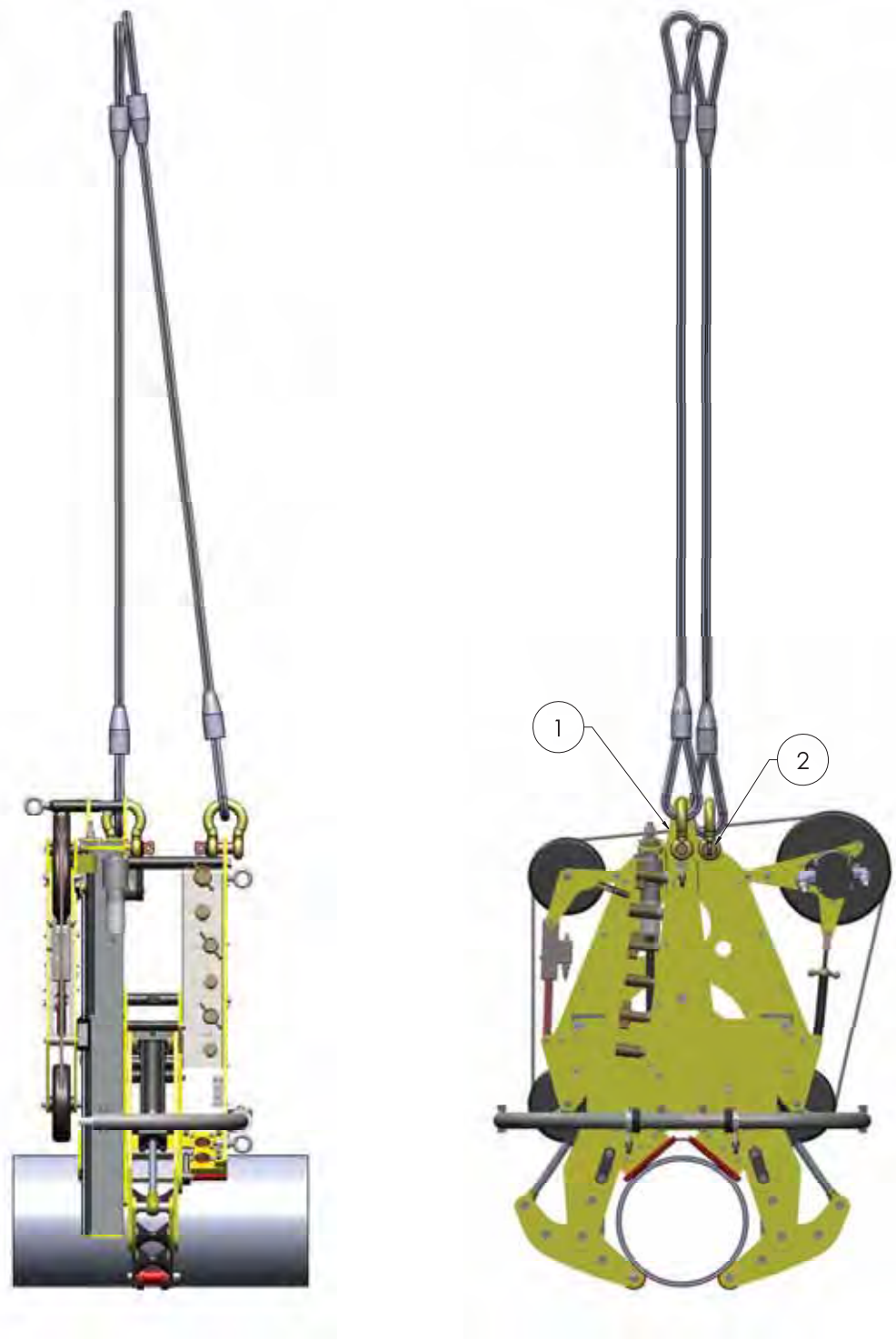

1
2
To position the machine vertically on the pipe attach rigging to the two top lift bosses (1 and 2)
Tip the machine to the vertical position, as shown then lift

Figure 1-11. The diagram illustrates rigging the DWS in a vertical orientation.

A rigging instruction label is attached to the top of the machine frame.

Figure 1-12. The rigging label is on top of the frame.

Lifting for Vertical Cut

Attach the machine to the lifting device using chains on the top lift hooks. Tip the machine up to a vertical position, then pick it up. Make sure the chains are the appropriate length to hold the machine reasonably straight.

IMPORTANT: Do not attach to this hook when lifting the machine vertically!

Figure 1-13. To position the machine vertically on the pipe, attach to the two top lift hooks.

WARNING

Warning - Do not stand under or near saw when it is being moved into place.

Lifting for Horizontal Cut

With the machine positioned horizontal on the floor or deck, attach a lift to the two hooks on the lift bar and the front hook on top of the frame.

CAUTION

The saw surface is not intended to be stepped or stood upon. To reduce the likelihood of a slip, trip, or fall hazard, do not step or stand on any part of the saw.

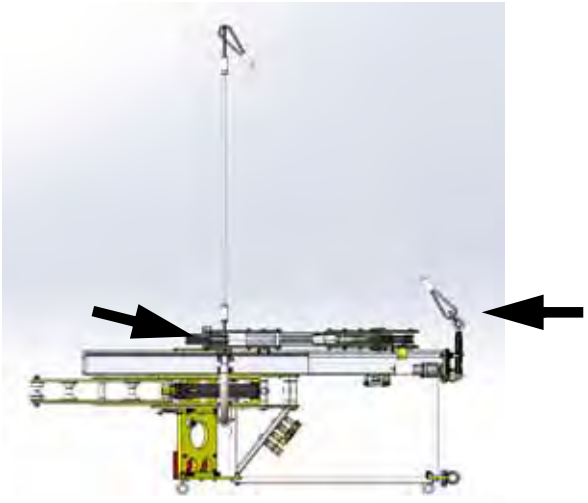


Figure 1-14. To position the machine horizontally on the pipe, attach to the two lift bar hooks and the front hook on the top.

Storing the Machine

Store the machine sitting horizontal with the front of it (the side with the Wachs logo) facing up. For long-term storage, clean and dry the machine thoroughly, then cover it with a waterproof cover.

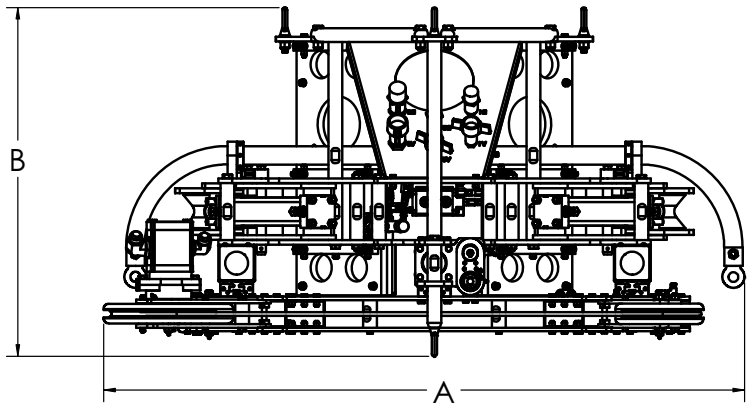
You can leave the wire installed on the machine during storage. But you must remove the tension from the wire to prevent damage to the drive and idler wheels.

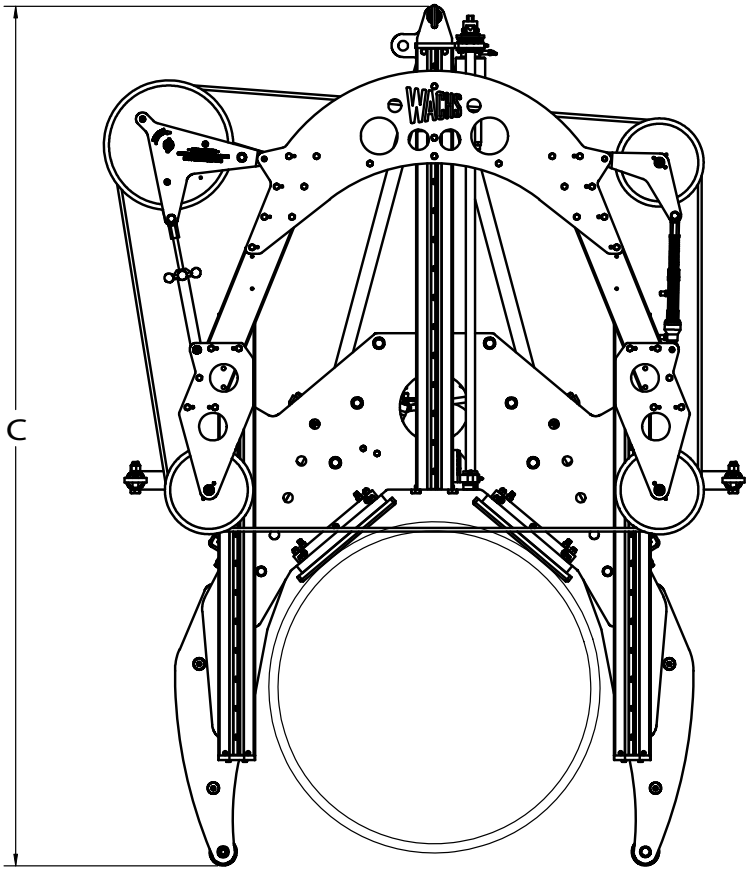
OPERATING ENVELOPE

The following table and drawing describe the operating envelope for all four diamond wire saw models. The "DIM" column in the table refers to the labeled dimensions on the drawing. "Stroke" is the feed distance of the saw bow.

Table 2: Operating Envelope Dimensions

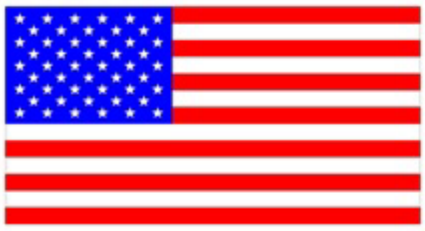
Model	DIM	Inches	MM
DWS-1604	A	49	1245
	B	28	712
	C	64	1626
	Stroke	22.9	582
DWS-3012	A	64	1626
	B	35	889
	C	83	2109
	Stroke	39.0	991
DWS-3616	A	70	1778
	B	38	966
	C	94	2388
	Stroke	43.9	1115
DWS-5230	A	88	2236
	B	49	1245
	C	131	3328
	Stroke	61.9	1572
DWS-8460	A	120	3048
	B	51	1296
	C	206	5233
	Stroke	99.6	2530
DWDWS-1604	A	53	1347
	B	46	1169
	C	64	1626
	Stroke	22.9	2530
DWDWS-3616	A	71	1804
	B	42	1067
	C	97	2464
	Stroke	43.9	2530


B
A


C

Information on Noise Emission

The following table below shows the noise emission levels per ISO 11688-1 for all Wachs Subsea LLC Diamond Wire Saws.

Diamond Wire Saw 10-010	Year Manufactured:	Operating	Idle
L_{pAm} (Frontal Position)		92 dB (A)	57 dB (A)
L_{pAm} (Other Positions)		89 dB (A)	57 dB (A)
The average difference between the extraneous noise level and the sound intensity level at each measuring point is:		L_{pAm} Δ = 34 dB (A)	
Ambient Correction Factor K3A calculated according to ISO EN 11204 Appendix A.		4 dB(A)	
Measurements were made at a height of 1.5 m and 1 m from the Operator Position and all four sides of the equipment.			
The figures quoted are emission levels and are not necessarily safe working levels. While there is a correlation between the emission and exposure levels this cannot be used reliably to determine whether or not further precautions are required. Factors that influence the actual level of exposure of the workforce include characteristics of the work room, the other sources of noise, etc. such as the number of machines and other adjacent processes. Also, the permissible level of exposure can vary from country to country. This information, however, will enable the user of the machine to make a better evaluation of the hazard and risk.			
	Wachs Subsea LLC 15331 Vantage Parkway East Houston, TX 77032 USA	CE	

Chapter 2
Safety

Wachs Subsea LLC takes great pride in designing and manufacturing safe, high-quality products. We make user safety a top priority in the design of all our products.

Read this chapter carefully before operating your Wachs Subsea equipment. It contains important safety instructions and recommendations.

In This Chapter

SAFE OPERATING GUIDELINES

SAFETY LABELS

SAFE OPERATING GUIDELINES

Follow these guidelines for safe operation of all Wachs Subsea equipment.

- **READ THE OPERATING MANUAL.** Make sure you understand all setup and operating instructions before you begin. Keep this manual with the machine.
- **INSPECT MACHINE AND ACCESSORIES BEFORE USE.** Before starting the machine, look for loose bolts or nuts, leaking lubricant, rusted components, and any other physical conditions that may affect operation. Properly maintaining the machine can greatly decrease the chances for injury.
- **ALWAYS READ STICKERS AND LABELS.** Make sure all labels and stickers are in place, clearly legible, and in good condition. Refer to “Safety Labels” later in this chapter for label locations on the machine. Replace any damaged or missing safety labels; see Chapter 5 for ordering information.

Look for this symbol throughout the manual. It indicates a personal injury hazard.

- **KEEP CLEAR OF MOVING PARTS.** Keep hands, arms, and fingers clear of all rotating or moving parts. Always turn the machine off and disconnect the power source before doing any adjustments or service.
- **SECURE LOOSE CLOTHING AND JEWELRY.** Secure or remove loose-fitting clothing and jewelry, and securely bind long hair, to prevent them from getting caught in moving parts of the machine.
- **FOLLOW SAFE PROCEDURES FOR HANDLING LUBRICANTS.** Refer to the manufacturer's instructions and the Material Safety Data Sheets.

Safe Operating Environment

- Do not use this equipment in a potentially explosive atmosphere. Fire or explosion could result, with the risk of serious injury or death.
- Provide adequate lighting to use the equipment, in accordance with worksite or local regulations.
- **KEEP WORK AREA CLEAR.** Keep all clutter and nonessential materials out of the work area. Only people directly involved with the work being performed should have access to the area.

Operating and Maintenance Safety

- This equipment is to be operated and maintained only by qualified, trained personnel.
- Make sure the equipment is stable when attached to the workpiece for the operation. Ensuring stability of the installed tool is the responsibility of the operator.
- Make sure the workpiece is supported adequately for installation of the equipment. This includes supporting any workpiece "fall-off" section when severing the workpiece. Ensuring support of the workpiece is the responsibility of the operator.
- Tooling on any cutting equipment—including lathe tools, saw blades, milling tools, etc.—may get very hot. Do not touch tooling until you have made sure it is cool enough to handle.
- Wear gloves when removing or cleaning up chips and cutting debris. Chips can be very sharp and cause cuts.
- Before performing any service on the equipment, disconnect the power source. Follow all lock-out/tag-out procedures required at the worksite.

Hydraulic Powered Equipment

- Hydraulic components such as hoses, motors, and manifolds will get hot during operation and may cause burns. Do not touch hydraulic components, except for operator controls, during or after operating the machine.
- **Hydraulic injection injury**—A pinhole in a hydraulic hose or fitting can eject fluid with enough force to pierce skin. Check hoses and fittings regularly for leaks. **Do not use bare hands to check for leaks while the system is pressurized.** If you suspect a leak, move a piece of paper or cardboard at least 6 inches (15 cm) over the suspicious area and watch for fluid spraying on the surface.

WARNING

Injection of hydraulic fluid through the skin is a serious injury that can result in infection, tissue damage, and possible loss of limb. **Seek medical treatment immediately.** First aid is not sufficient treatment for injection injury.

Loss or Shut-Off of Power Supply

- If the power source to the equipment is lost, disconnect power from the equipment and lock out the power supply immediately to prevent accidental restarting of the machine.
- For all power sources, follow all lock-out/tag-out procedures required at the worksite when disconnecting or servicing the equipment.

Safety Alerts in This Manual

The following alerts are used throughout this manual to indicate operator safety hazards. In all cases, these alerts include a notice describing the hazard and the means to avoid or reduce risk. Carefully read all safety alerts.

This icon is displayed with any safety alert that indicates a personal injury hazard.

WARNING

This safety alert, with the personal injury hazard symbol, indicates a potentially hazardous situation that, if not avoided, **could** result in **death or serious injury**.

⚠ CAUTION

This safety alert, with the personal injury hazard symbol, indicates a potentially hazardous situation that, if not avoided, **could** result in **minor or moderate injury**.

Protective Equipment Requirements

Protective Clothing

Wear safety shoes when operating or servicing the equipment. Serious injury could result from dropping the machine or its components.

Eye Protection

Always wear impact-resistant eye protection while operating or working near this equipment.

For additional information on eye and face protection, refer to Federal OSHA regulations, 29 Code of Federal Regulations, Section 1910.133., Eye and Face Protection and American National Standards Institute, ANSI Z87.1, Occupational and Educational Eye and Face Protection.

Hearing Protection

This equipment can produce noise levels above 80 dB. Hearing protection is required when operating the equipment. The operation of other tools and equipment in the area, reflective surfaces, process noises, and resonant structures can increase the noise level in the area.

For additional information on hearing protection, refer to Federal OSHA regulations, 29 Code of Federal Regulations, Section 1910.95, Occupational Noise Exposure and ANSI S12.6 Hearing Protectors.

SAFE OPERATION OF THE DWS

Intended Uses

The DWS is designed to be clamped onto an in-line or open-ended pipe using its hydraulic clamp system, and cut through the pipe using a high-speed abrasive diamond wire.

Make sure to follow all safety guidelines and procedures required for machining operations at the work site, including personal protective equipment (PPE). Do not use the DWS in a manner that violates these guidelines.

Proper Use of the Diamond Wire Saw

- The DWS should only be used by trained, qualified operators.
- The workpiece must be within the operating capacity of the DWS model you are using. See operating envelope information and drawings in Chapter 1.
- Make sure the operating environment allows you to mount the machine securely and squarely on the work-piece.
- Make sure there is adequate clearance around the DWS and workpiece to operate the machine controls as described in the operating instructions (Chapter 3).
- Mount the DWS in an orientation that allows convenient connection of the hydraulic power supply hoses.
- Use the DWS only on pipes that are cleaned as required, and do not contain hydrocarbons or any other matter that may be explosive or hazardous to the environment. If there is a risk that the pipe contains anything but atmospheric pressure, use appropriate care and risk mit-igation for the situation.

Misuse

- Do not attempt to mount or operate the DWS on any workpiece to which it cannot be securely clamped.
- Do not attempt to mount or operate the DWS on any workpiece that is not stable enough to hold the machine.
- Do not mount the DWS on the “fall-off” side of the cut line, unless you adequately rig and support the saw and workpiece.

SLIP/TRIP/ FALL HAZARD

- Do not disable any safety feature of the DWS or remove any safety labeling. Replace worn or damaged safety labels immediately. (See "Safety Labels" later in this chapter.)
- The saw surface is not intended to be stepped or stood upon. To reduce the likelihood of a slip, trip, or fall hazard, do not step or stand on any part of the saw.
- The saw is electrically conductive. To reduce the risk of electric shock and death, do not use this equipment out of doors under any circumstance during an electrical storm or for a minimum of 1/2 hour after the end of the storm.

Potential Hazards

Figure 2-1 illustrates potential hazards of operating the DWS. Refer to the description of each hazard for guidelines on safe operation.

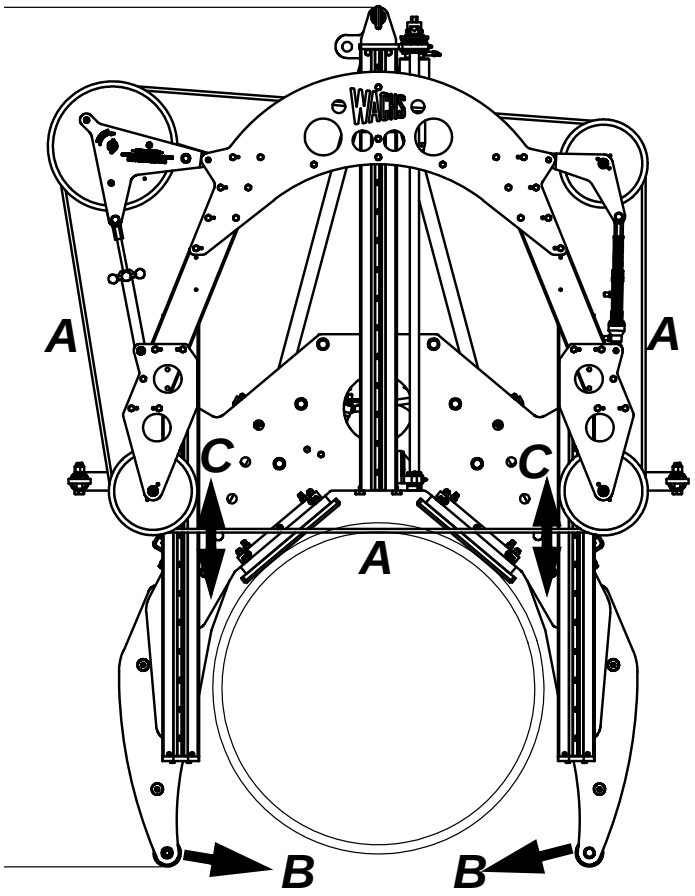


Figure 2-1. Potential operating hazards of the DWS. See the descriptions in the side column.

A. Cutting wire—the abrasive diamond wire moves at high speed and will cause serious injury. Stay the required safe distance from the DWS when it is operating (see Table 2 on page 28).
B, C. Moving Parts Hazard—Keep hands and feet clear when operating the clamp drive and feed drive motion.

Guidelines for Safe Setup, Operation, and Service

Pre-Operation Checklist

Every time you use the DWS, perform the following checks to make sure it is in good operating condition:

- Check that all safety components are operating properly.
- Inspect it for damage or wear that could affect operation and safe use of the machine. Repair any defective component before using the machine.
- Make sure the machine is clean and properly lubricated.
- Make sure that the diamond wire is sharp and in good condition. A poor quality wire can cause difficult cutting and the possibility of machine malfunction and/or injury.

- Check hydraulic connections to make sure they are in good condition.

Operating Safety

- Stop the DWS cutting motion and disable hydraulic power before adjusting the workpiece (shim, wedge, clear chips, etc.) or making any machine adjustments.
- Use a support structure or catch device to prevent the cut-off piece of the pipe from falling.
- Keep hydraulic hoses away from moving parts while operating the machine.
- Use of this equipment generates hot sparks. This equipment is not designed to operate safely in an ATEX type environment. When cutting piping used to process hydrocarbon-based materials, operate this equipment in conjunction with a gas sniffer (user-supplied) suitable to detect material(s) processed through the pipe. To reduce the likelihood of fire or explosion, the hydrocarbon materials detected by the sniffer must be below the LEL established for those materials. Mitigation of fire or explosion hazards due to use of the equipment is NOT the responsibility of Wachs Subsea LLC.

FIRE/ EXPLOSION HAZARD

Service Checklist

- Disconnect power from the DWS during service.
- Retract the saw bow before performing service. Do not disassemble any components of the saw with the wire in the workpiece.

Safe Lifting and Handling

Use care when lifting the DWS to avoid injury. All DWS models are too heavy to be lifted by one person. A lifting device (crane or hoist) is required for lifting and mounting the saw. Use the lift eyes on the saw to lift it. Do not attach the lifting device to other components.

- It is the responsibility of the end user to determine whether a machine or assembly can be lifted by two or more people. A lifting device is recommended for machines or assemblies that cannot be handled easily by two people.
- Do not rig or lift the DWS while power is attached.

Machine Weights

Table 1 lists the weights for each DWS model.

Table 1: Diamond Wire Saw Weights

Model	Part Number	Weight in Air	Weight in Water
DWS-1604	10-010-516	600 lb 273 kg	430 lb (196 kg)
DWS-3012	10-010-530	720 lb 327 kg	532 lb 241 kg
DWS-3616	10-010-536	830 lb 377 kg	555 lb 252 kg
DWS-5230	10-010-552	1,106 lb 503 kg	815 lb 370 kg
DWS-8460	10-010-584	Consult Factory	
DWDWS-1604	10-010-516-ROV	1,280 lb 582 kg	50-120 lb 23-55 kg
DWDWS-3616	10-010-536-ROV	1,895 lb 861 kg	50-120 lb 23-55 kg
DWDWS-5230	10-010-552-ROV	2,400 lb 1089 kg	50-120 lb 23-55 kg

SAFETY LABELS

HAZARDS DUE TO HEIGHT

Use safety consciousness at all times if it becomes necessary to service areas of this equipment when above 6 ft (1.8 m). Use of a safety harness when working aloft is highly recommended.

SAFETY DISTANCE

Maintain a safe distance from the wire saw while it is operating, whether or not it is actually cutting. If the wire breaks while it is moving, serious injury could occur.

Table 2: Safe Distance for Diamond Wire Saws

Model No.	Safe Distance
DWS-164	25 ft (7.6 m)
DWS-3012	30 ft (9.2 m)
DWS-3616	35 ft (10.7 m)
DWS-5230	45 ft (13.8 m)
DWS-8460	70 ft (21.4 m)

The following photos show the locations of the safety labels on the standard DWS and the deepwater DWS.

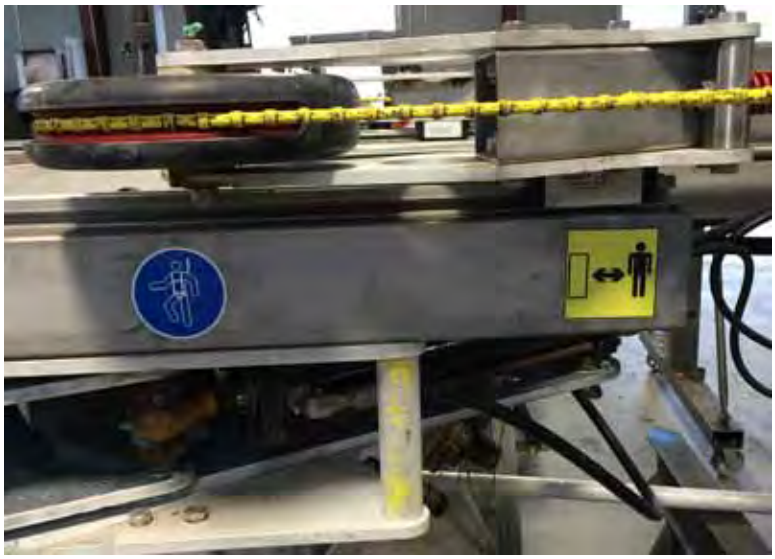


Figure 2-2. Safety labels on the standard DWS saw frame (labels are on both sides of the saw).

Figure 2-3. Safety labels on the standard DWS bulkhead.

Figure 2-4. Safety labels on the DWDWS saw frame (labels are on both sides of the saw).

Figure 2-5. Safety labels on the DWDWS bulkhead.

Figure 2-6. Safety labels on the ROV control panel.

Chapter 3

Operating Instructions

In This Chapter

TENSIONING THE CUTTING WIRE

ADJUSTING CLAMP ARMS FOR THE PIPE SIZE

CONNECTING THE HYDRAULIC HOSES

MOUNTING THE MACHINE ON THE PIPE

PERFORMING THE CUT

REMOVING THE MACHINE

TENSIONING THE CUTTING WIRE

You should have the wire installed according to the maintenance instructions in Chapter 4.

1. Preload the tension of the diamond wire by off setting the back of the washer and the brass rod gland by a distance of 1/4”-1/2”.

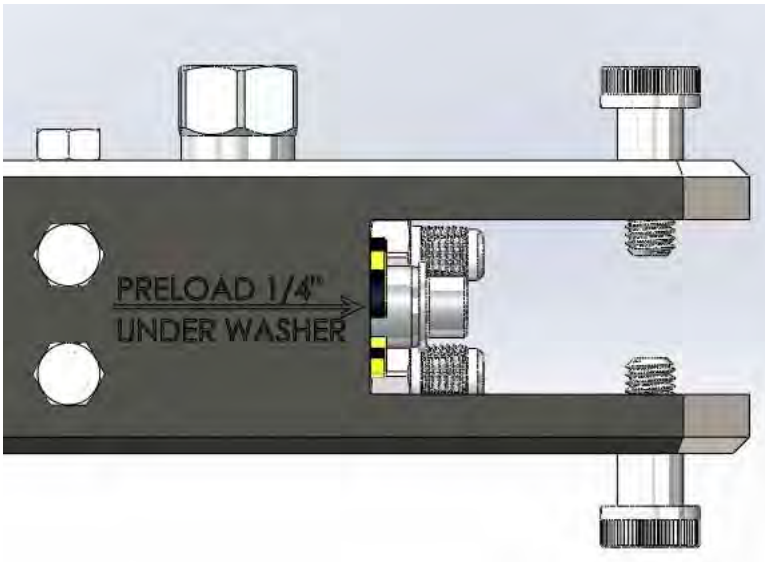


Figure 3-1. Distance of brass rod gland and washer should be 1/4”-1/2”.

2. Tighten the drive wheel tensioning knob, as shown in Figure 3-2, until you can see the line on the spring-loaded driver wheel, Figure 3-3.

Figure 3-2. Turn the tension knob on the drive wheel fixture to increase the tension on the wire. (Depending on the exact length of the wire, about 3-4" of the screw will be visible when the tension is set correctly.)

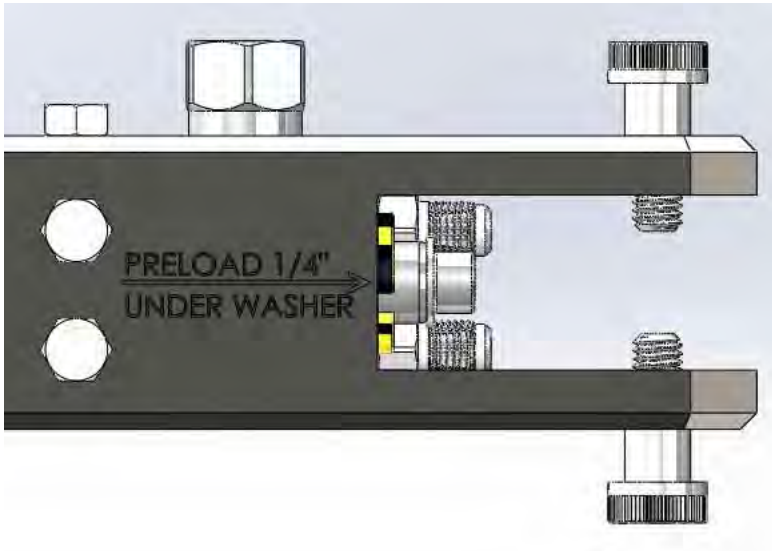


Figure 3-3. When the wire is properly tensioned the distance between the brass rod gland and the washer should be 1/4"-1/2".

3. You should be able to deflect the wire fairly easily by pushing it up between the idler wheels.

ADJUSTING CLAMP ARMS FOR THE PIPE SIZE

The clamp arms are attached to the main frame using forked pins that go through two holes in the frame. Multiple sets of holes allow the arms to be mounted in various positions.

The hole pairs for each position are stamped with the size of the largest pipe for that position. Refer to the following sections for the pipe size settings for each saw model.

DWS-1604 Pipe Size Settings

Table 1 describes the pipe size settings for the DWS-1604 model.

Table 1: Pipe Size Ranges for Clamping Arm Positions—DWS-1604

Size Stamp	Pipe Diameter Range
7	4” to 7” (102-178 mm)
10	7” to 10” (178-254 mm)
13	10” to 13” (254-330 mm)
16	13” to 16” (330-406 mm)

DWS-3012 Pipe Size Settings

Table 2 and Figure 3-4 describe the pipe size settings for the DWS-3012 model.

Table 2: Pipe Size Ranges for Clamping Arm Positions—DWS-3012

Size Stamp	Pipe Diameter Range
14	12" to 14" (305-356 mm)
18	14" to 18" (356-457 mm)
22	18" to 22" (457-559 mm)
26	22" to 26" (559-660 mm)
30	26" to 30" (660-762 mm)

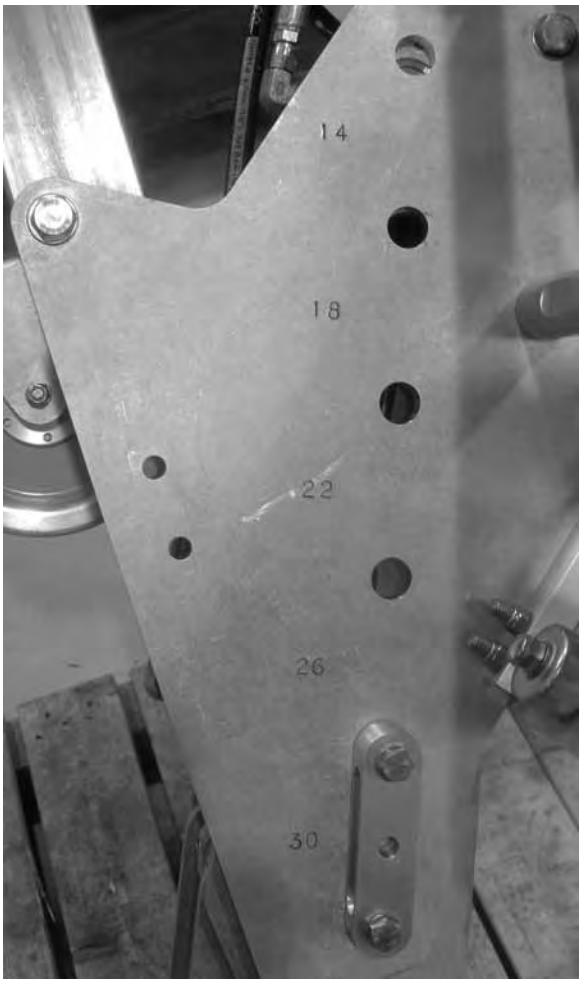


Figure 3-4. The photo shows the size stamps on the DWS-3012 model. The pin is in the 26-30" position.

DWS-3616 Pipe Size Settings

Table 3 and Figure 3-5 describe the pipe size settings for the DWS-3616 model.

Table 3: Pipe Size Ranges for Clamping Arm Positions—DWS-3616

Size Stamp	Pipe Diameter Range
20	16” to 20” (406-508 mm)
24	20” to 24” (508-610 mm)
28	24” to 28” (610-711 mm)
32	28” to 32” (711-813 mm)
36	32” to 36” (813-914 mm)

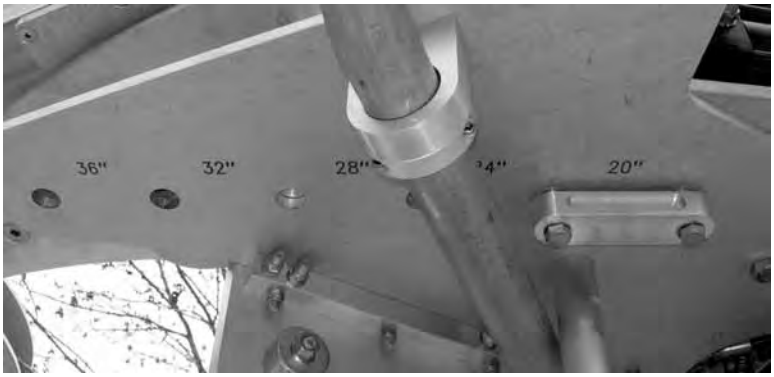


Figure 3-5. The photo shows the size stamps on the DWS-3616 model. The pin is in the 16-20” position.

DWS-5230 Pipe Size Settings

Table 4 and Figure 3-6 describe the pipe size settings for the DWS-5230 model.

Table 4: Pipe Size Ranges for Clamping Arm Positions—DWS-5230

Size Stamp	Pipe Diameter Range
34	30" to 34" (762-864 mm)
40	34" to 40" (864-1016 mm)
46	40" to 46" (1016-1168 mm)
52	46" to 52" (1168-1321 mm)

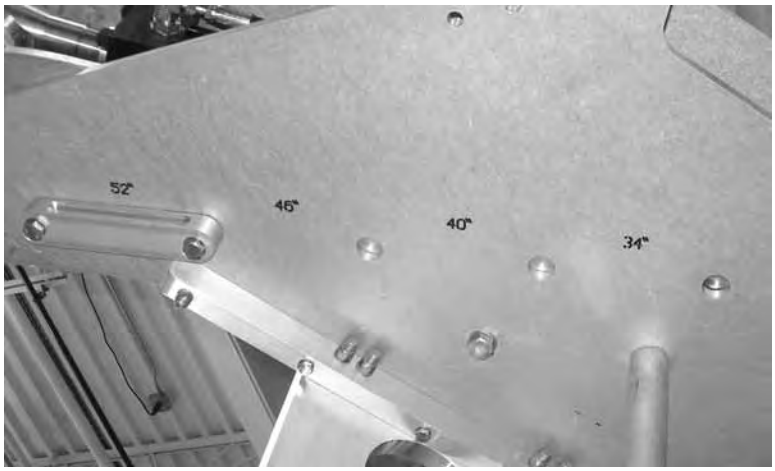


Figure 3-6. The photo shows the size stamps on the DWS-5230 model. The pin is in the 46-52" position.

DWS-8460 Pipe Size Settings

Table 5 and Figure 3-7 describe the pipe size settings for the DWS-8460 model.

Table 5: Pipe Size Ranges for Clamping Arm Positions—DWS-8460

Size Stamp	Pipe Diameter Range
66	52” to 66” (1320-1676 mm)
72	66” to 72” (1676-1828 mm)
78	72” to 78” (1828-1981 mm)
84	78” to 84” (1981-2133 mm)

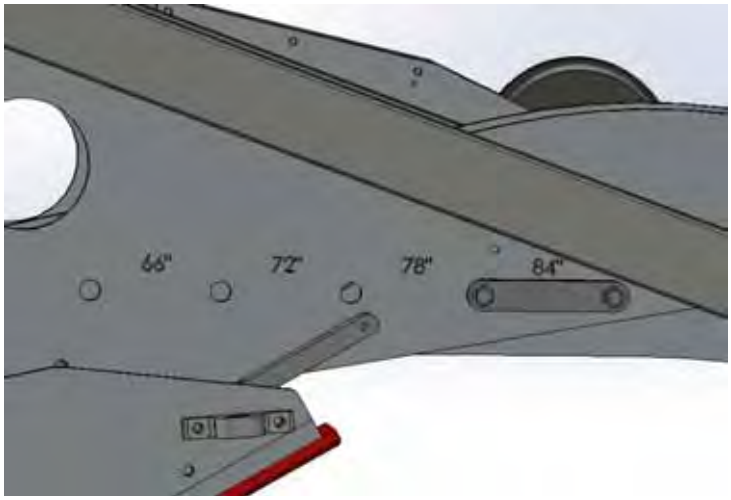


Figure 3-7. The photo shows the size stamps on the WS-8460 model. The pin is in the 78” to 84” position.

Positioning the Clamp Arms

Make sure the saw is sitting horizontally on a level surface before you adjust the clamp arms.

WARNING

Do not attempt to change the clamp arm positions while the saw is in a vertical position. The clamp arms may fall when the pins are removed, resulting in personal injury and equipment damage.

1. Remove the spring clips from both pin ends of the forked pin, then pull the forked pin out of the frame.

Figure 3-8. Remove the spring clips from both ends of the forked pin, then pull the pin out from the other side.

CAUTION

Make sure both clamping arms are set at the same position. If they are not the same, the machine may not clamp securely on the pipe. Damage to the machine could result.

2. Slide the clamp arm assembly so that the mounting holes line up with the appropriate hole pair for the pipe size you are cutting.

3. Insert the forked pin through the back of the machine.

Figure 3-9. Insert the forked pin through the hole pair for the pipe size range (in this case, 46-52") you are cutting.

4. Insert the spring clips in the forked pin on the front of the machine.

5. Set the position of the other clamp arm to the same location.

CONNECTING THE HYDRAULIC HOSES

Connect the hydraulic hoses from the universal control panel (UCP) to the hydraulic bulkhead on the machine. Table 6 describes the connections for each hydraulic circuit. Figure 3-10 shows the connectors on the back of the UCP. Figure 3-11 shows the connectors on the saw bulkhead.

Table 6: DWS Circuit Connections

Circuit Connection	Saw Panel Label	UPC Back Panel Label
Clamp drive circuit pressure	A1	Clamp Close
Clamp drive circuit return	B1	Clamp Open
Feed drive circuit pressure	A2	Feed In
Feed drive circuit return	B2	Feed Out
Cutting drive circuit pressure	A3	Cutter Pressure
Cutting drive circuit return	B3	Cutter Tank

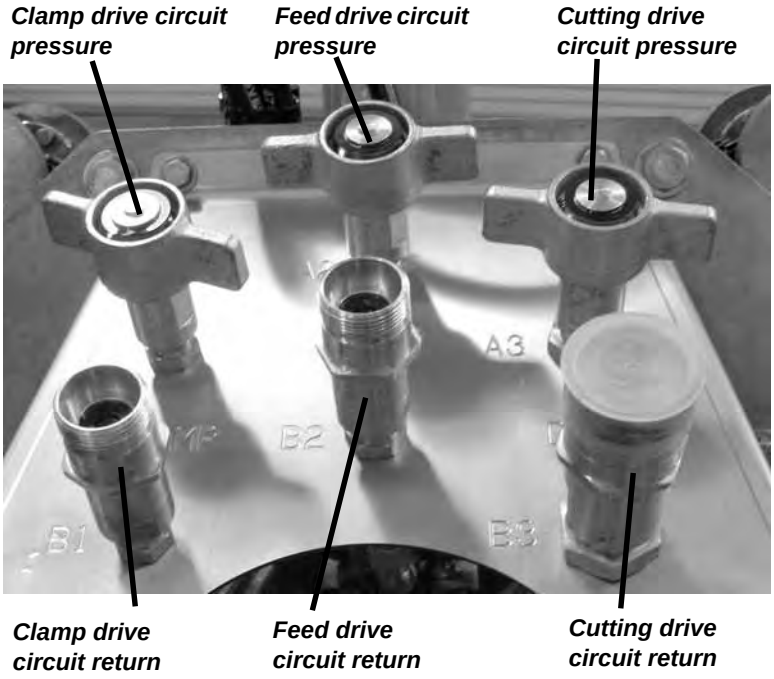


Figure 3-10. Attach the hydraulic hoses to the bulkhead on the saw as shown. The ports marked "A" are pressure lines from the UCP; the ports marked "B" are return lines to the UCP.

CAUTION

Any system or part of a system than can be disconnected and sealed so that trapped fluid can be subject to a pressure increase or decrease shall include means for limiting the pressure if the change can cause a hazard. Installer must provide all pressure safety devices required by local code.

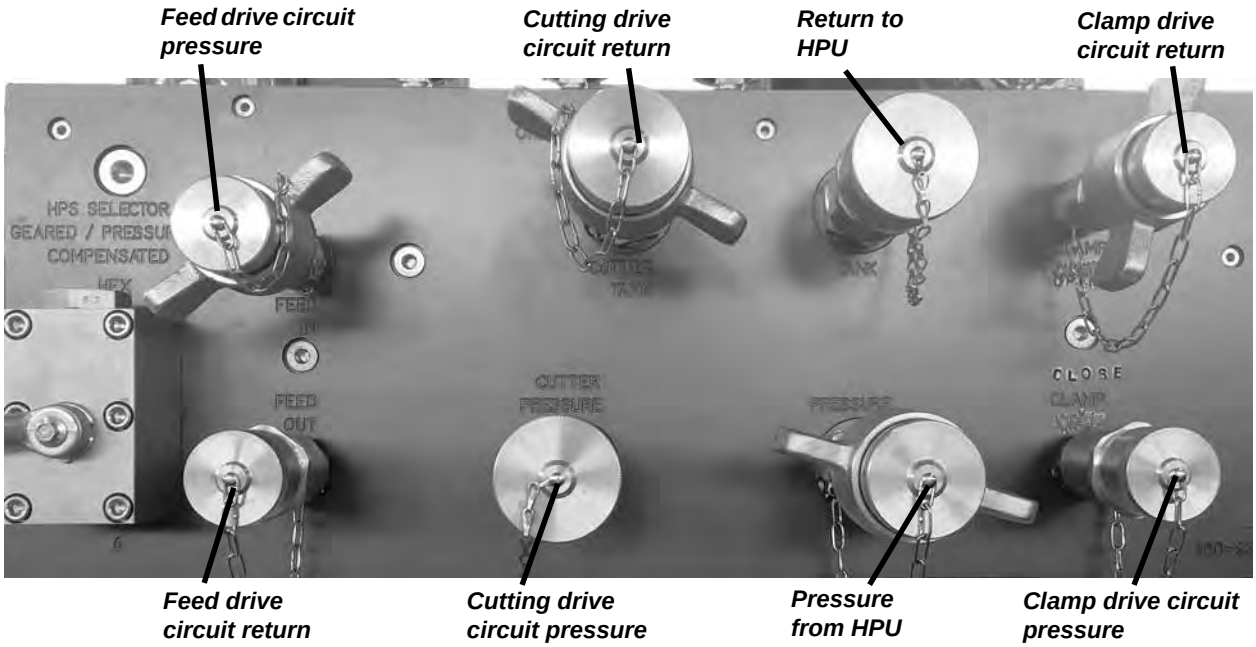


Figure 3-11. Attach the hydraulic hoses to the back of the UCP as shown.

WARNING

The cutting wire spins at very high speed. If the wire breaks, segments of the wire can fragment and be thrown from the machine at dangerous speeds. Stay a safe distance from the machine, or behind a protective barrier, when operating it topside. **Serious injury or death could result from contact with the wire or as a result of the wire breaking**.

Before lowering the machine subsea, test all three drive circuits to make sure they are working.

Hydraulic schematics and fitting part numbers are included with the drawings in Chapter 5.

MOUNTING THE MACHINE ON THE PIPE

See “Rigging the Machine” in Chapter 1 for instructions on lifting the machine to position it for horizontal or vertical cuts.

CAUTION

Lift the machine ONLY on the lifting eyes provided. Lifting on any other component could damage the machine.

- Attach lifting shackles to the appropriate lift eyes for the orientation of the machine.
- Before lowering the machine subsea to the cutting location, make sure the clamping arms are fully open.

NOTE

The flow on the clamp circuit is set internally at 4 gpm.

Set the controls on the UCP as follows:

- Set the cutter drive lever to OFF
- Cutter speed knob to 17.5 - 20 gpm (set when running)
- Feed speed knob to 1.5 gpm (Set on Fly)
- (Clamp flow is preset to 4 gpm)
- Clamp direction to UNCLAMP
- Feed direction to NEUTRAL
- (Cutter direction is preset to forward).

1. Align the machine at the desired cut line, perpendicular to the center axis of the pipe. The clamping arms should extend around the pipe and the mounting shoes should be against the pipe, or close to it.

2. Start the hydraulic power unit. Set it to provide 22 gpm flow at 3000 psi.

3. Switch the clamp switch to “CLAMP”. Watch the clamping pressure gauges to ensure that the pressure is within 1900-2200 psi.

WARNING

The saw is electrically conductive. To reduce the risk of electric shock and death, do not use this equipment out of doors under any circumstance during an electrical storm or for a minimum of 1/2 hour after the end of the storm.

CAUTION

As you operate the machine, check the clamping pressure frequently to make sure it stays above 1700 psi. If it gets too low, stop the machine and reclamp it to the pipe.

WARNING

The cutting wire spins at very high speed. If the wire breaks, segments of the wire can fragment and be thrown from the machine at dangerous speeds. Make sure all personnel are at a safe distance before starting the cutting drive. **Serious injury or death could result from contact with the wire or as a result of the wire breaking.**

CAUTION

Use of this equipment generates hot sparks. This equipment is not designed to operate safely in an ATEX type environment. In order to increase the likelihood of safely cutting piping used to process hydrocarbon based materials, this equipment must be operated in conjunction with a gas sniffer provided by the Saw user that is suitable to detect the material(s) processed through the pipe. To reduce the likelihood of fire or explosion, the hydrocarbon materials detected by the sniffer must be below the LEL established for said process material. Explosion or fire mitigation due to use of the Saw is not the responsibility of Wachs Subsea LLC.

PERFORMING THE CUT

1. Push the feed flow lever to "FEED IN" to start the feed circuit.

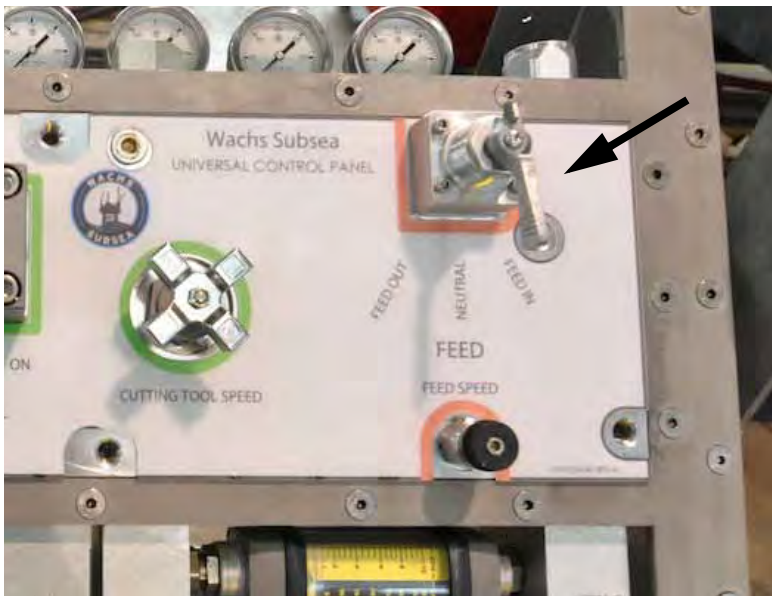


Figure 3-12. Push the feed flow lever to "FEED IN" to supply power to the feed drive.

2. Set the feed speed knob to 2.0 gpm.

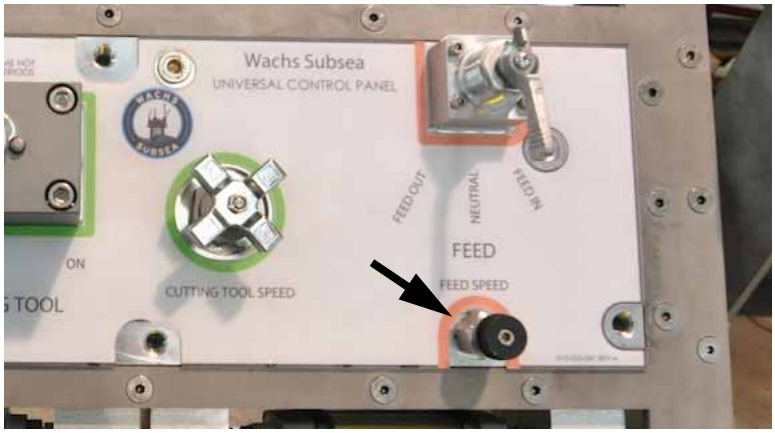


Figure 3-13. Push the feed speed knob down to 2.5 gpm.

3. Visually monitor the position of the cutting wire as the bow feeds toward the pipe. When the wire is within 1/4" of the pipe surface, push the feed flow lever to the neutral position to turn off the feed drive.

4. Push the cutting drive flow lever to "ON" to open the cutting drive circuit.

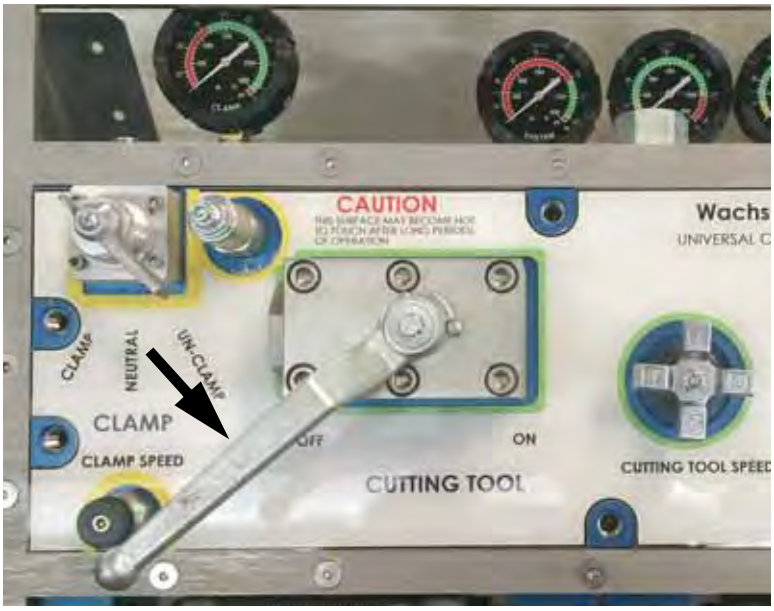


Figure 3-14. Push the cutting flow lever to "ON" to supply power to the cutting drive.

5. Start with the cutting speed knob at 20 gpm. Visually ensure that the wheels are spinning.

Figure 3-15. The photo shows the flow meter. Start with the cutting speed knob at 20 gpm.

NOTE

The larger the pipe size, the longer it will take to feed the cutting wire close to the pipe. This is because smaller pipes fit closer between the mounting shoes.

NOTE

It is recommended that a signal man be used for above ground sawing operations like the dive master provides needed information for underwater operations.

NOTE

At the minimum operating speed, the drive wheel will be spinning at about 1500 RPM.

NOTE

If a stoppage occurs for unexpected reasons, the operator should not allow the saw to restart until he verifies the cutting zone is clear of bystanders.

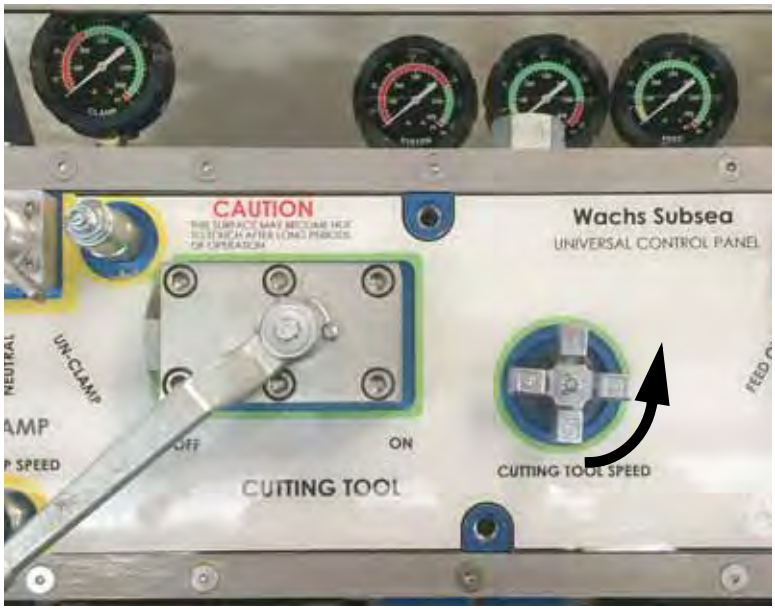


Figure 3-16. Turn the cutting speed knob up to increase the drive wheel speed.

6. Push the feed flow lever to the "FEED IN" position to start feeding the wire into the pipe. The feed flow meter should read 2.0 gpm-2.5 gpm, This is automatically regulated by the feed control actuator.

7. As the wire enters the cut, increase the cutting speed by moving the cutting speed knob. Do not go above 20 gpm for 16-52" machines, 29 gpm for 84" machines.

8. During cutting, the feed control actuator on the tension wheel fixture adjusts the feed rate to keep the saw from overfeeding. It should not be necessary to adjust the feed rate at the UCP.

9. Continue until the wire has completely severed the pipe.

10. Pull the feed flow lever to "NEUTRAL" to turn off the feed drive.

NOTE

The feed drive will travel about 2 inches beyond the bottom of the largest pipe size.

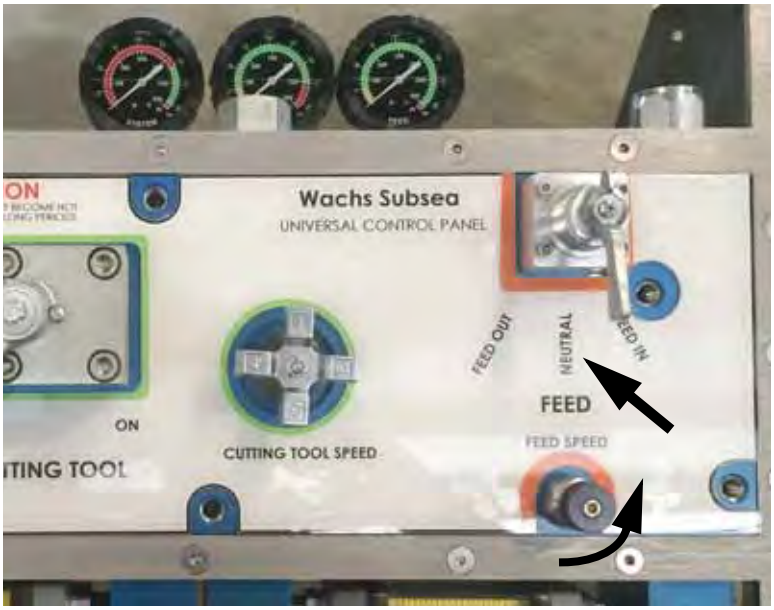


Figure 3-17. Turn the feed flow knob counter-clockwise and pull the feed flow lever to "NEUTRAL" to turn off the feed drive.

11. Pull the cutter flow lever to "OFF" to turn off the cutter drive.

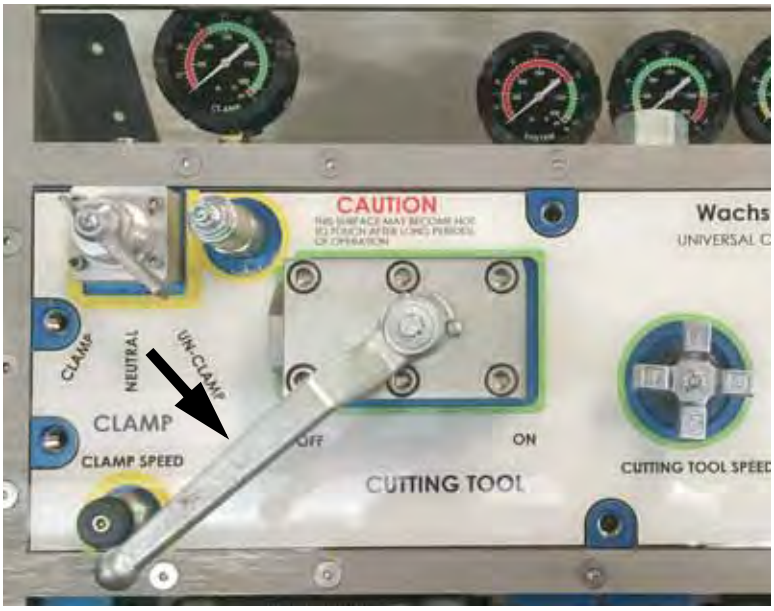


Figure 3-18. Pull the cutter flow lever to "OFF" to turn off the cutter.

NOTE

If a pipe must be recut to remove saw, keep wire running and reverse the feed. Set the speed to 2.0-2.5 GPM.

REMOVING THE MACHINE

1. Set the feed direction knob on the UCP to "FEED OUT" to start the feed circuit.

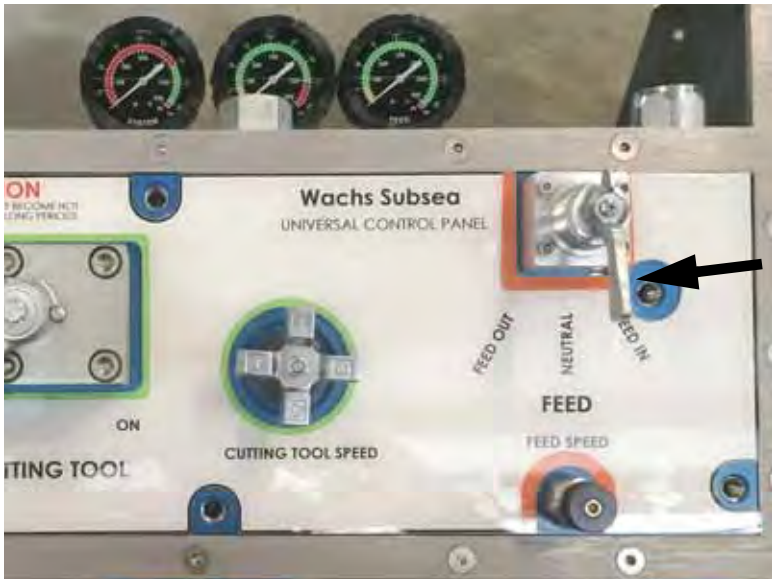


Figure 3-19. Set the feed direction knob to "FEED OUT."

2. Turn the feed speed knob to 6.5 gpm (maximum flow).

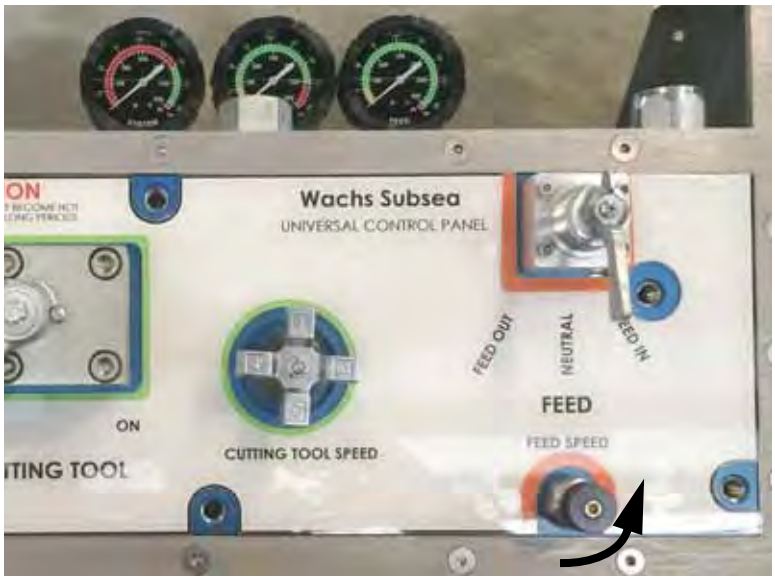


Figure 3-20. Turn the feed speed knob up to the maximum setting.

3. When the saw bow is at its home position, pull the feed flow lever to “NEUTRAL” to stop the feed drive.

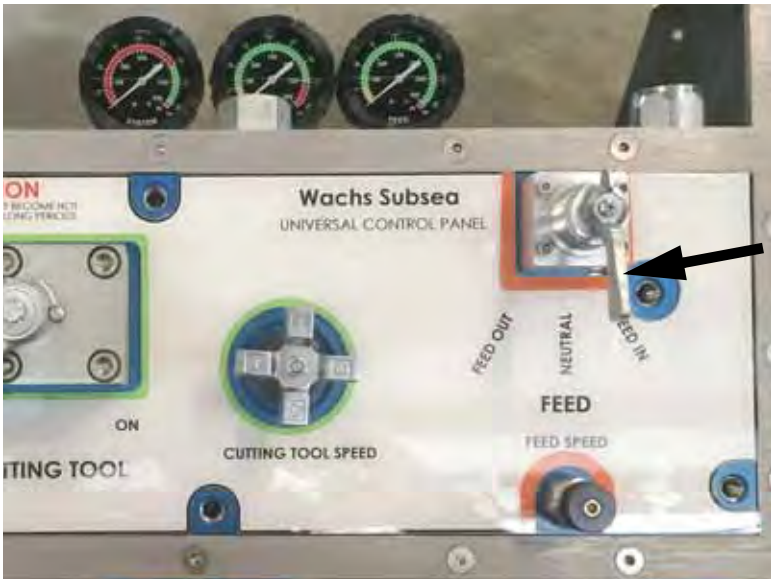


Figure 3-21. Pull the feed flow lever to “NEUTRAL” to turn off the feed drive.

4. Rig the shackles to the overhead lift. Lift just enough to put tension on the chains and secure the machine.

5. Push the clamping direction knob to the “UNCLAMP” position.

Figure 3-22. Set the clamping direction knob to UNCLAMP.

NOTE

It will take about 30 minutes to retract the feed drive on a 36 inch pipe.

6. Turn the clamping flow knob down until the clamp arms are fully open. Verify that the clamp arms are fully open.

7. Lift the machine off the pipe. Move it to the next cutting location or bring it topside if you are finished.

DEEPWATER CONVERSION AND OPERATION

The Deep Water Diamond Wire Saw (DWDWS) is an enhanced version of the saw for use in deep water by ROV. The saw has a 3000 m rated syntactic flotation package designed to minimize the footprint. By installing a large portion of the flotation internally the width and length of the saw remains the same. The flotation module on the bow increases the height of the saw by only 6.00".

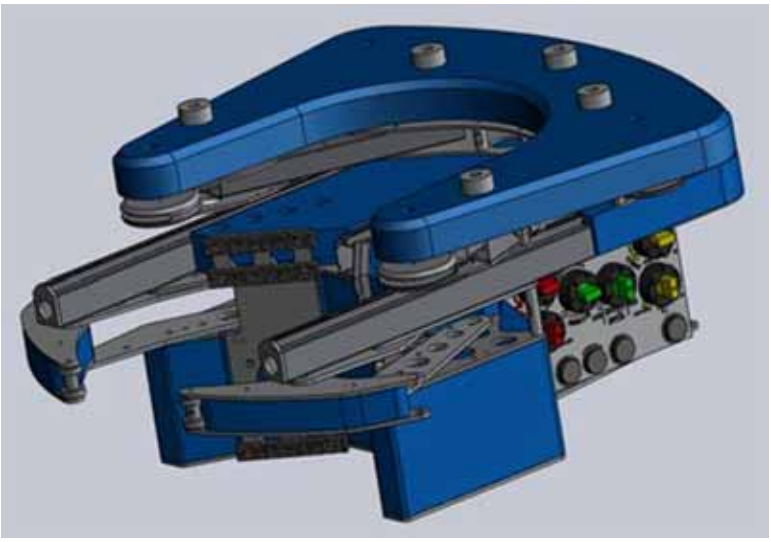


Figure 3-23. The drawing illustrates the DWDWS-164 saw with flotation and ROV control panel.

The flotation package has been designed to coincide the center of gravity with the center of flotation such that the saw can be manipulated (turned upside down) by the ROV on location. Ballast has been added to make the saw approximately 100 lbs negative in salt water.

ROV Controls

ROV compliant handles allow the ROV to manipulate and position the saw during operations. These handles are painted bright red for easy identification.

Figure 3-24. The photo shows the ROV control panel/ manifold installed on the DWDWS.

A control manifold and ROV control panel are installed on the saw to enable the ROV to operate it. The directional control and ball valves have HD knobs and stops. The valves can be operated by either grasping the knobs or manipulating the indicator rods. The knobs on the ROV panel have clutches installed on the shafts to prevent the ROV from twisting off the shaft. The clutch works in both directions.

The flow controls valves should be pre-set on the surface before deployment. They should not need to be adjusted on location, but if necessary, the ROV can adjust them by turning the appropriate knob.

Figure 3-25. The ROV control panel/manifold allows the saw to be operated by ROV.

Deployment Basket

The saw is utilized with a HD deployment basket to assist in transiting the saw to location. The basket has a mudmat that elevates the floor of the basket approximately 24" off the seafloor to help prevent disturbing the seafloor sediment. The basket also has a counterbalanced gate that provides a large landing platform when opened. This gate is counterbalanced to minimize the effort when opening or closing and it also holds the gate in either the open or closed position.

Figure 3-26. The photo shows the saw deployment basket.

Two (for redundancy) HD sliding bolts hold the gate closed during launch and recovery operations. Both these bolts are retained in their closed position by a simple HD detent.

Figure 3-27. The basket gate is secured by two sliding bolts.

When open, the bolts do not fold down to make it obvious to the pilot that they are open. Holes are provided in the bolt handles for the installation of monkeys fists if desired.

The basket has a center post to which the saw is hydraulically clamped for deployment and recovery.

The basket also has a female hotstab and compensator built into the floor so the saw's hydraulic manifold can be compensated while transiting depth.

Figure 3-28. The photo shows the compensator with female hotstab for compensating the hydraulic manifold during deployment.

Inside the basket is a bracket specifically installed to hold a survey beacon.

Figure 3-29. The photo shows the survey beacon bracket in the basket.

Converting ROV Control Panel to Remote Control Bulkhead

The drawings in Chapter 5 illustrate the DWDWS configurations with the two different control panels.

Lift points are provided on the ROV control panel, as shown in the figure below. Remove the red ROV handles from the frame, then insert lift eyes in the panel as shown (2 locations).

CAUTION

Do not lift the entire saw assembly by the ROV panel lift eyes. Damage to the machine will result.

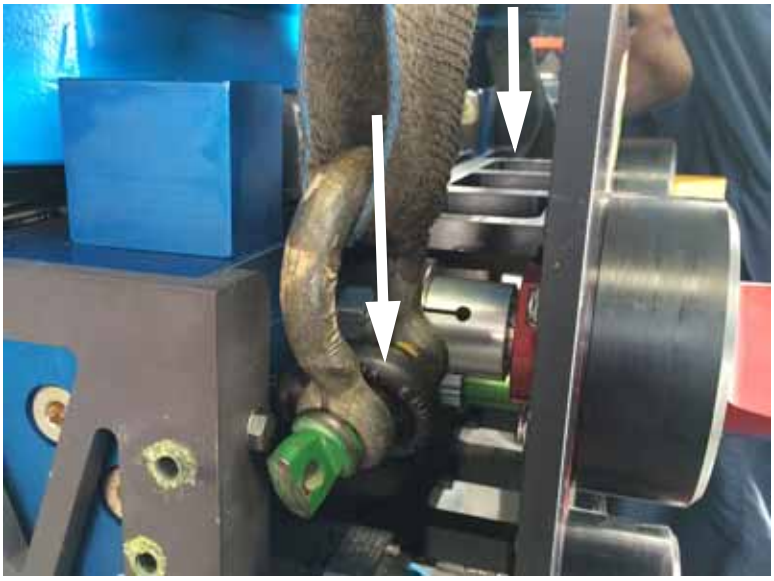


Figure 3-30. Lift the ROV panel as shown for installing and removing the panel. The eye bolts screw into threaded holes in the frame; remove the eye bolts before deploying the saw.

Ballast Weights

Bolt-on weights are provided to balance the saw and provide the required buoancy when configured for deepwater use. Different weight combinations are required for ROV and remote-operation configurations.

Figure 3-31. When the DWDWS is configured with the remote operation panel, install 4 weights to the flotation as shown.

Figure 3-32. When the DWDWS is configured with the ROV operation panel, install 2 weights to the flotation as shown.

Hydraulic Hose Alignment

Hoses on the feed motor and the drive motor must be repositioned when switching between the ROV control panel and remote operation bulkhead.

Figure 3-33. When the DWDWS is configured with the ROV operation panel, align the drive motor hose on the right as shown (standard DWS configuration).

Figure 3-34. When the DWDWS is configured with the ROV operation panel, align the feed motor hose on the right as shown (standard DWS configuration).

Figure 3-35. When the DWDWS is configured with the remote operation panel, re-align the drive motor hose on the right as shown.

Figure 3-36. When the DWDWS is configured with the remote operation panel, re-align the feed motor hose on the right as shown.

Figure 3-37.

Setup

It is suggested that a WSS female zero leak hotstab be installed in a convenient location on the ROV. The saw will have a 20ft (or length as requested) hydraulic flying lead with a male zero leak hotstab. Simply pushing the male hotstab into the female will make the connection. Orientation matters, connecting the hotstab backwards will cause the saw to operate backwards. The WSS hotstab will disconnect by pulling on the male or by pulling on the hoses in the event of a dead sub recovery. With this in mind a horizontal position for the female hotstab is advised. The WSS zero leak hotstabs allow very little seawater into the hydraulic system and are routinely used without an IHPU. It is left to the ROV operator whether to use an IHPU or not.

The saw requires 20gpm at 2000psi. The saw will operate at lower pressures and flows but performance will be reduced. The hydraulic components are rated to 3000psi however the drive wheel is intended to stall should the wire get pinched and operating the saw at 3000psi may cause the wheel to

slip instead which will destroy the liner. A spare thruster circuit with flow control and a pressure reducing valve would be ideal.

The control manifold has cross port PO check valves on the clamp circuit. The clamps will stay engaged until pressure is applied to retract them. There is an option to bypass these valves such that the saw will release itself in the event of a ROV hydraulic failure. If this is preferable methodology then alternate valves can be supplied. However, an alternate method will be required to retain the saw in the deployment basket (not developed yet).

Operation

Predeployment

Function test the saw before every deployment!
Make sure the controls on the panel of the saw are all neutral before connecting the saw to the ROV. (A surface HPU should be used for extensive testing and troubleshooting in order to not overheat the ROV.)

Function test the clamp circuit by operating the directional control valve. Adjust the flow control if required.

Function test the wire drive circuit by first opening the ball valve with the flow control closed. Then open the flow control until the desired flow is achieved. A flow meter is installed on the manifold for setup and diagnostic purposes. Close the flow control first to stop the wire drive motor then close the ball valve. This procedure is preferable to preserve the shaft seals on the drive motor.

Function test the feed circuit by operating the directional control valve. Feed in EXTEND should be limited to 2.5gpm and is adjusted at the feed control unit. Feed in RETRACT will be much higher as the feed control circuit is bypassed.

Test the feed control circuit. This circuit is designed to limit and stop the feed motor when a certain force is applied to the wire. Install a ratchet strap as shown *(insert picture)* and with the saw set to feed EXTEND operate the ratchet strap to simulate feeding into a cut. At approximately 6" of bow

in the wire the feed motor should slow down and eventually stop. Reversing the feed at this point should cause the bow to retract unrestricted. The wire only needs to be tensioned so there is approximately 1/4" under the washer as shown to operate. However, in high consequence situations the feed can be made to shut down earlier (with less stress on the wire) by tensioning the wire such that there is a 1/2"-5/8" gap under the washer. This will slightly decrease the cut rate but will increase success rate.

Efficient and safe operation of the saw will be obtained by the coordination of operating the valves on the control panel and turning the hydraulic supply on and off at the ROV.

Install the saw into the deployment basket and operate the clamps to secure the saw to the stump. Leave the directional control valve in the CLAMPED position while turning off the hydraulic supply.

Remove the hotstab from the ROV and install it into the female hotstab in the basket. Ensure the compensator in the basket is approximately 3/4 full.

Put the clamp directional control valve in the OPEN position.

Put the wire drive valve in the ON position.

Turn the wire drive flow control clockwise to close the needle valve.

The saw should be launched with the valve in the following positions

Clamps - OPEN (valve position - not clamps!)

Clamp flow - preset (does not require further management)

Wire Drive - ON

Wire Drive flow - closed (turn in SLOW direction until the wire stops)

Feed - Neutral

Feed flow - preset (should not require further management)

Coil the hydraulic flying lead as desired and close the gate.

Lock the gate closed by closing the sliding bolts and engaging the handles past the detent.

Tiewrap the bolt handles if desired with the tiewrap running through the monkeys fist. This will allow the ROV pilot to break the tiewraps by pulling on the monkeys fists and at the same time disengaging the handles from the detents.

The saw is now ready to deploy.

The basket has a lift point designed for a Crosby 17t shackle (G-2130 p/n 1019631). Deployment methodology is the responsibility of the client. However it is suggested to install a 17t shackle with two 1" masterlinks such that a handshake can occur between the crane launching the basket and a winch used to deploy the basket to depth.

When the basket reaches a suitable location on the seafloor ensure that the spreader bar folds to the back of the basket so not to obstruct the removal of the saw.

At this point the ROV would unlock the gate by pulling on the monkey fists which breaks the security tiewraps and pulls the latch handles past the detent knobs. The latches would then be slid to the open position and the door would be opened.

Next the hotstab would be removed from the parking position in the basket and connected to the ROV to supply hydraulic fluid to the saw.

Since the clamp valve on the saw is already in the OPEN position all the ROV operator needs to do at this point is turn on the hydraulic supply to the saw and the clamps will open releasing the saw from the basket.

Once the clamps are open the hydraulic supply should be turned off and then the clamp valve manipulated to the CLOSE position in preparation of installing the saw on the pipe.

The saw can be grasped by any of the ROV compliant handles and transited to the cut location.

The saw would then be installed into position on the pipe and by re-applying hydraulics to the saw the clamps will close without requiring the ROV to manipulate valves at the same time as handling the saw.

The clamp circuit can be left in the CLOSE position during the cut.

Next, the ROV would start the wire drive by turning the flow control valve CCW x number of turns. This number of turns was predetermined during deck testing. If it is obvious that the wire is travelling too slow the valve can be opened as required.

Next the ROV would manipulate the feed control valve to the ADVANCE position. Observing the feed clutch mechanism on the back of the saw it should be turning CCW at about 1 revolution in 30 seconds.

The feed rate is purposely set slightly lower than normal (land work) to accommodate a high consequence cutting scenario. Once a routine has been established and it is observed that cutting success is consistent the rate can be increased. This is done at the feed control block.

Marks have been installed on the guide rails to indicate start and finish locations so that time is not wasted by retracting the bow too far in preparation for the next cut.

Operating pressures

During the cut monitor the pressure gauges particularly the wire drive pressure. This pressure should be (A)___psi (observe and fill in when operating at depth) when not cutting and approximately A+ 0psi to 750psi when cutting normally. If the wire drive pressure approaches A+ 1000psi then the feed is too aggressive and wire stall or breakage may occur. To alleviate this turn off the feed until the pressure returns to normal.

Should the wire stall during a cut immediately turn off the hydraulics to the saw to preserve the drive wheel liner. Reverse the feed direction to relieve tension on the wire. When the pressure has been relieved start up the wire drive again and recommence the cutting operation.

Should the wire remain stalled with the tension relieved then the wire is pinched in the cut likely due to movement of the pipe. Cutting operations must be managed such that the cut tends to open up as the cut progresses.

Cutting effectiveness

Cutting effectiveness diminishes after time. The number of cuts per wire will need to be developed according to actual cutting conditions and round trip times. Depending on cutting conditions 2 cuts per wire on 18" pipe should be achievable.

End of cut indication

Because these cuts are planned to occur in a dredged pit under the pipe visibility might be obscured enough such that the end of cut cannot be directly observed. There are three indicators on the saw to determine end of cut. First there is a mark on the guide rail tube that indicates (roughly) where the end of cut should occur. Second, observing the feed control unit can show exactly when the cut has completed by comparing the gap under the washer at the end of the control rod. When cutting, this gap will be noticeable and about 3/4-1". As soon as the cut finishes this gap will return to the setup gap of about 1/4". Lastly, and most effective, is to observe the wire drive pressure gauge. This pressure will momentarily increase to similar levels as when cutting through the crown and then suddenly drop off to (A)psi recorded earlier.

When the cut is complete reverse the feed direction and return the bow to the start position. Leave the wire running until it passes the bottom crown of the pipe so it does not catch which will lead to wire breakage.

Every time the saw comes back to deck it is advisable to grease it according to the DWS manual as well as spray LPS3 (or equivalent) lubricant on all the moving parts of the control manifold. The clutches are lubricated with Aqualube and should not need lubrication unless disassembled.

Chapter 4
Maintenance

In This Chapter

LUBRICATION

REPLACING THE CUTTING WIRE

REPLACING THE MOUNTING SHOES

REPLACING THE WHEEL LINERS

ADJUSTING THE FEED CONTROL UNIT

LUBRICATION

Every time you use the machine, lubricate the following components.

1. Slowly pump multi-purpose No. 2 EP marine grease into the grease fittings on each of the 4 wheel hubs. (Do NOT use AquaLube on the wheel hubs.) Figure 4.1

Figure 4-1. Each wheel hub has a grease fitting.

CAUTION

Do not directly apply lubricant to the feed screw.

2. Pump AquaLube into the grease fittings on the feed gears, feed motor, and feed block (4 fittings). Figure 4.2

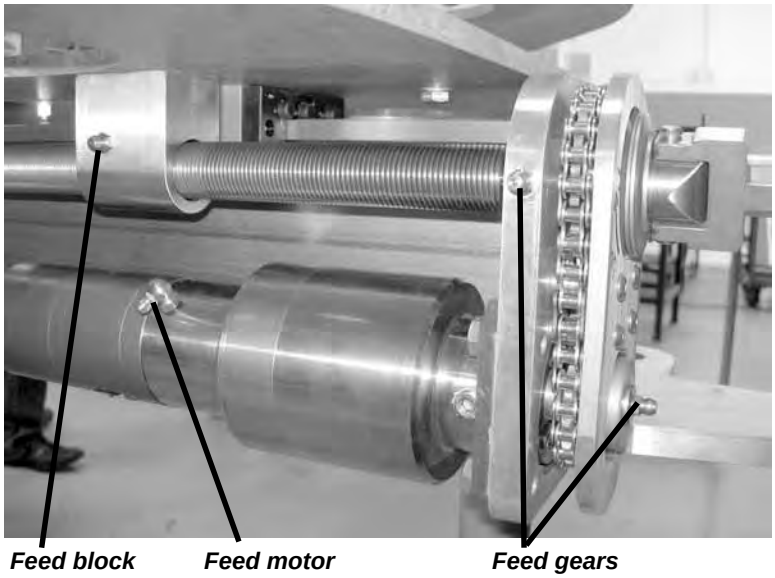


Figure 4-2. Grease the feed components shown at the top of the feed system.

3. Pump AquaLube into the grease fitting on the feed screw mount at the bottom of the screw. Figure 4.3

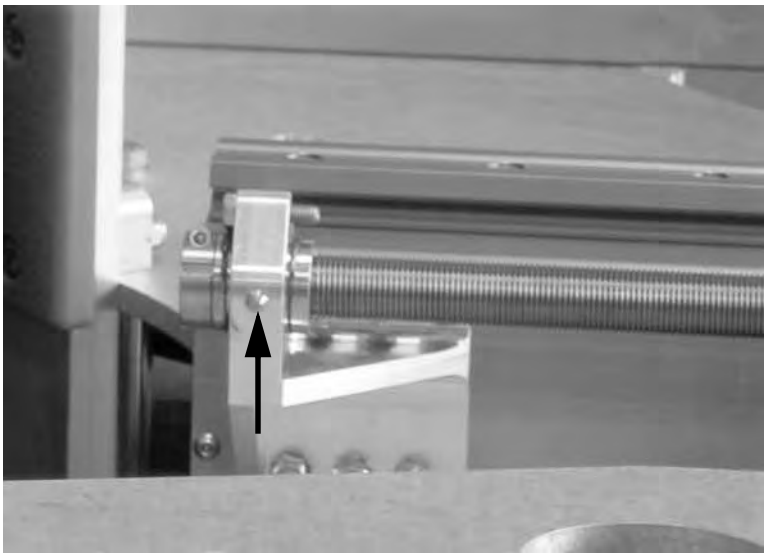


Figure 4-3. Grease the fitting at the bottom of the feed screw.

4. Pump AquaLube into the grease fittings on the cylinder rod ends until grease is visible. Figure 4.4

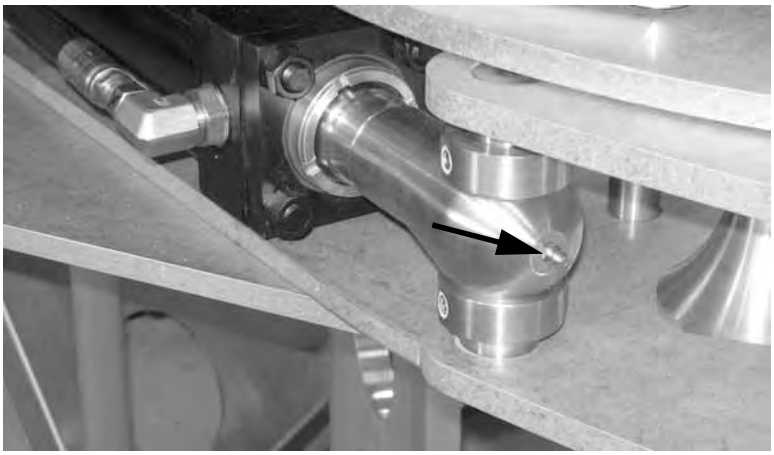


Figure 4-4. Both clamping cylinders have a grease fitting on the rod end.

Drive Motor Lubrication

After every time the saw is deployed, lubricate the drive motor using the following procedure.

1. Remove the 1/8 NPT plug opposite the drive assembly grease fitting.
2. Pump a quality **EP2 marine grease** into the hub through the grease fitting until the grease starts to come out of the plug hole.
3. Operate the drive motor assembly at full rated speed for 5 minutes with the plug removed. (Excess grease will flow out of the plug hole.)
4. Wipe off excess grease and reinstall the plug.

The drive motor assembly is now ready to use. **NOTE**: The grease fitting on the opposite side of the drive motor lubricates the bearing on top of the motor hub. It has been filled at the factory.

REPLACING THE CUTTING WIRE

Start with the saw bow retracted all the way to the top of the frame.

CAUTION

Wear gloves when handling the wire. The abrasive surfaces are sharp and could cut your hands.

1. Turn the tension knob on the drive wheel fixture all the way down to release the tension on the wire.

Figure 4-5. Turn the tensioning knob all the way down on the screw to loosen the wire.

2. Slip the wire off the drive wheel, then remove it from the other wheels.

3. Different brands of wire have different markings to indicate cutting direction. Look at the new wire closely to determine direction.

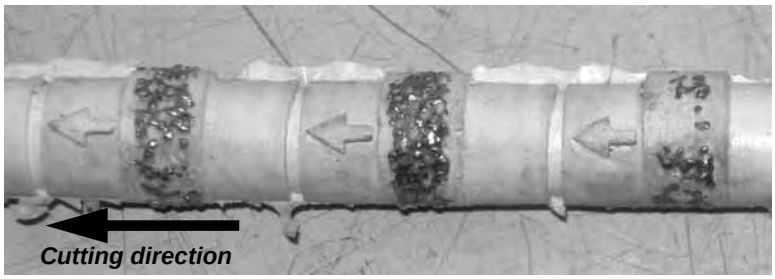


Figure 4-6. This wire has molded arrows indicating the cutting direction.

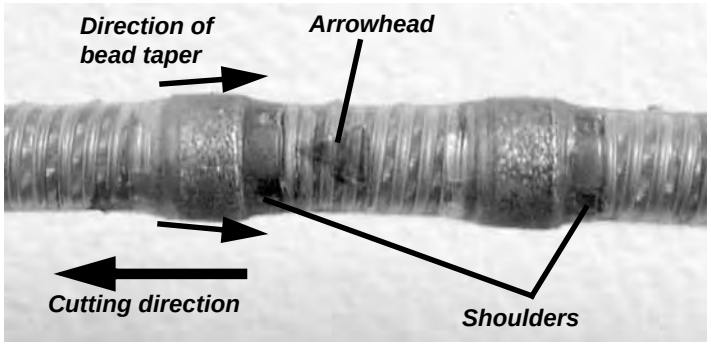


Figure 4-7. This type of wire has arrowheads molded into the plastic coating. The dark "shoulder" of the cutting bead should trail the bead as the wire cuts.

4. Place the new wire over the wheels, in reverse order of removing the wire. Be sure to mount it so that the arrows are in the direction of travel.

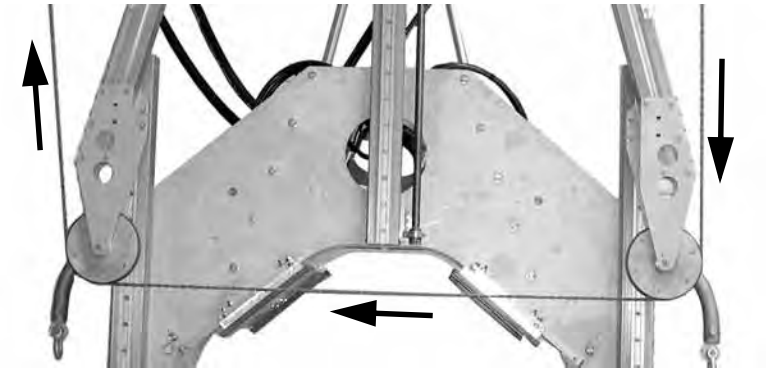


Figure 4-8. Install the wire so that the arrows point in the direction of travel, as shown.

5. Turn the drive wheel tension knob until the wire starts to tighten and stays on the wheels.

6. To prepare the machine for a new cut, set the wire tension as described in the operating instructions in Chapter 3.

REPLACING THE MOUNTING SHOES

You may have to replace the mounting shoes if they are damaged or worn. Four screws attach each shoe to the frame.

NOTE

Some wires do not have directional markings. Look for the direction of the bead taper to determine direction. (The narrow end of the bead should lead into the cut.) Contact the wire manufacturer if you're not sure of the wire's direction.

NOTE

The drive wheel fixture is stamped with an arrow showing the direction of rotation.

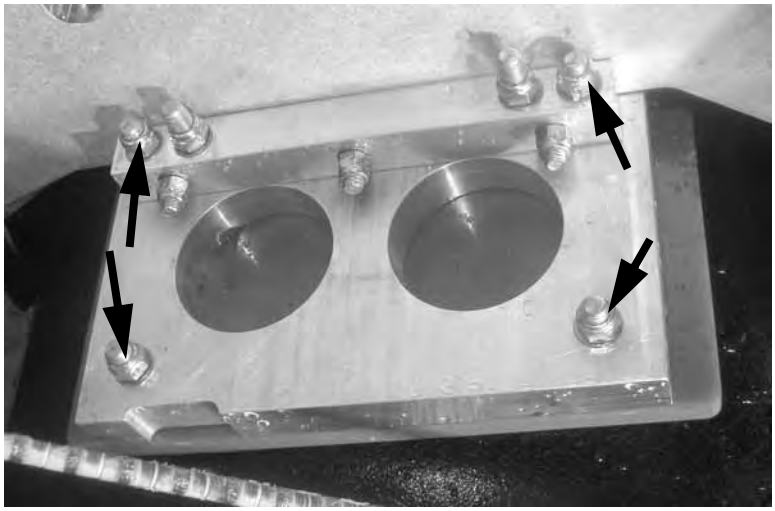


Figure 4-9. The four screws indicated hold the shoe to the machine frame.

1. Remove the nuts on the four screws holding the shoe in place.
2. Remove the shoe.
3. Put the new shoe in place and replace the screws.
4. Replace the nuts and tighten them securely.

REPLACING THE WHEEL LINERS

The liners on the cutting wire wheels are durable and long-lasting. They may wear out after extensive use, or be damaged if the saw malfunctions. If necessary, replace them using the following procedure.

The tension wheel and 2 idler wheels are identical. The drive wheel is assembled differently than the others.

Tension and Idler Wheels

Remove the cutting wire before taking off any of the wheels.

1. Remove the nut on the end of the hub bolt and pull the bolt out of the wheel mounting fixture.

Figure 4-10. Remove the hub bolt to take off the wheel. The bolt head is on top in this view, with the nut on the bottom of the fixture.

2. Remove the wheel from its mounting fixture and set it on a work surface. You can work on either side of the wheel.

3. Remove the 8 screws holding the side plate in place. You only need to remove one side plate.

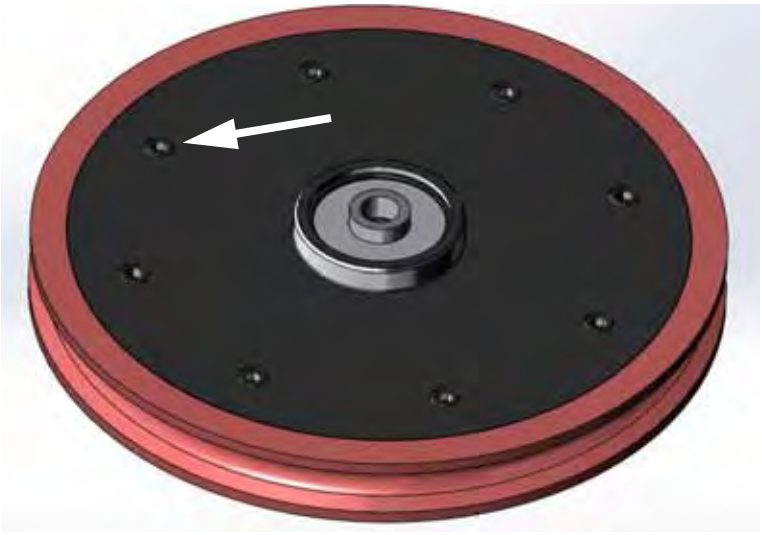


Figure 4-11. Remove the screws from the side plate to take it off.

4. Remove the side plate.

5. Remove the old wheel liner. You may have to pry it loose with a screwdriver.

NOTE

Some models have covers over the wheels. You can separate and remove the cover after you take the wheel out of the wheel mounting fixture.

NOTE

It may be easier to work on the wheel if you set it on something that supports the side plate, with a gap for the hub shaft to keep it from sitting on the shaft.

Figure 4-12. Pull the liner off the wheel. You may have to pry it with a screwdriver to get it loose.

6. Place the new liner on the wheel and press it down into place.

Figure 4-13. Put the new wheel liner on the wheel.

7. If you removed the shaft, replace it through the center of the wheel.

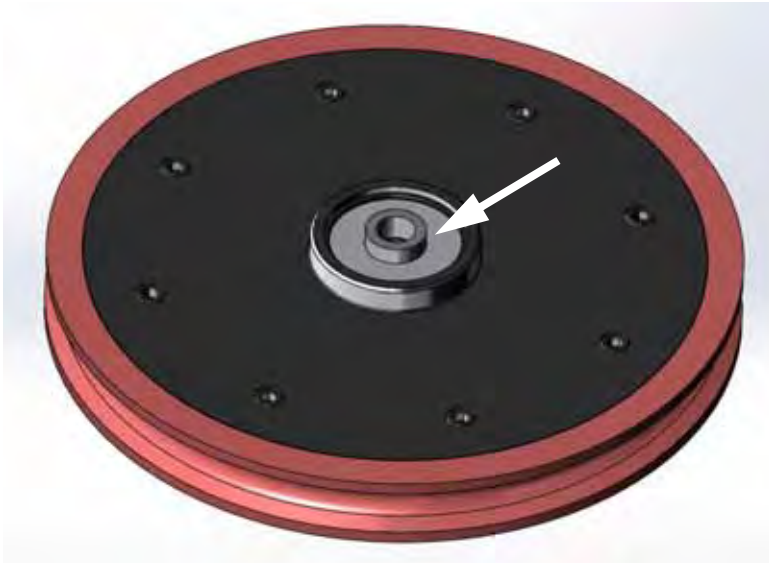


Figure 4-14. Replace the shaft through the center of the wheel.

8. Replace the side plate. Line up the holes in the plate with the holes in the wheel.

9. Fasten the side plate with the 8 screws. Snug each screw, then tighten them in a criss-cross pattern to secure the wheel evenly.

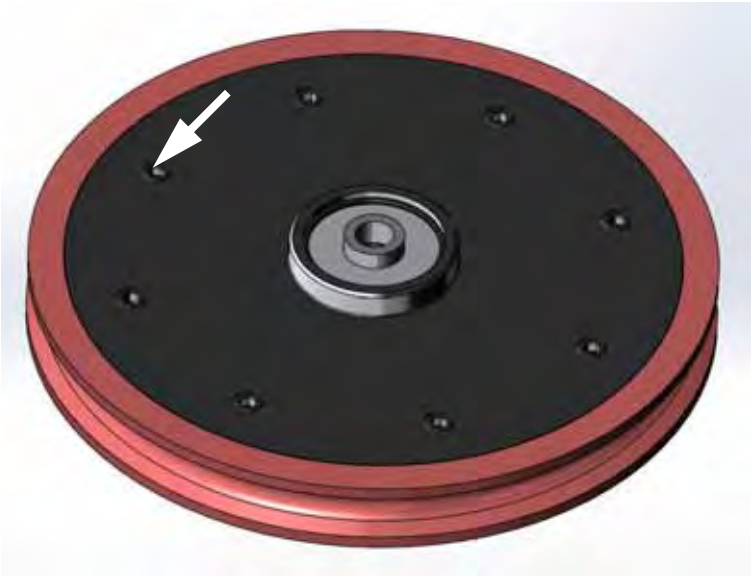


Figure 4-15. Replace the screws in the side plate.

10. Replace the wheel into its mounting fixture. Put the bolt through the top of the fixture, and install the nut on the bottom. Tighten the nut securely.

Drive Wheel

Remove the cutting wire before taking off any of the wheels.

To replace the drive wheel liner, you must first remove the wheel and motor assembly from the saw bow using the following procedure.

1. Hold or support the drive wheel and hydraulic motor assembly, so that it does not fall when you remove the fasteners holding it to the saw bow.

2. Unbolt the shoulder screw by loosening the nut on the back side of the frame bow.

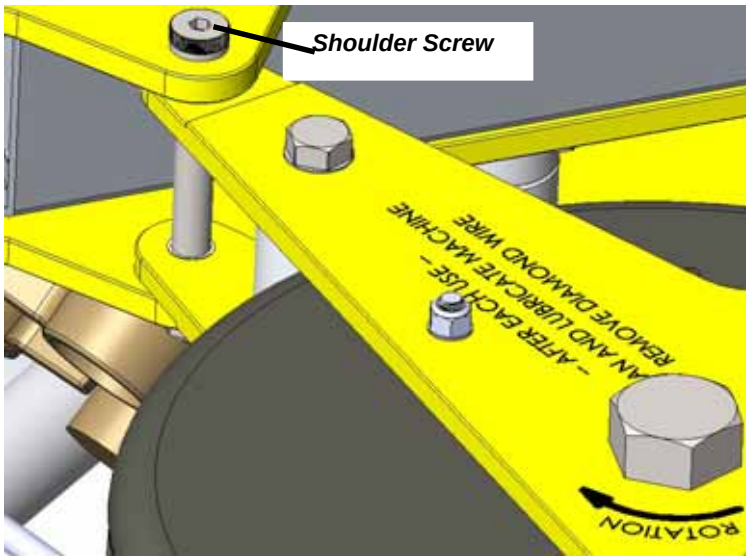


Figure 4-16. Unbolt the shoulder screw from the drive wheel plate

3. Remove the nut from the bolt holding the wheel assembly to the tension rod, then remove the bolt, now pull the shoulder bolt up and the wheel and motor assembly will be free from the saw bow.

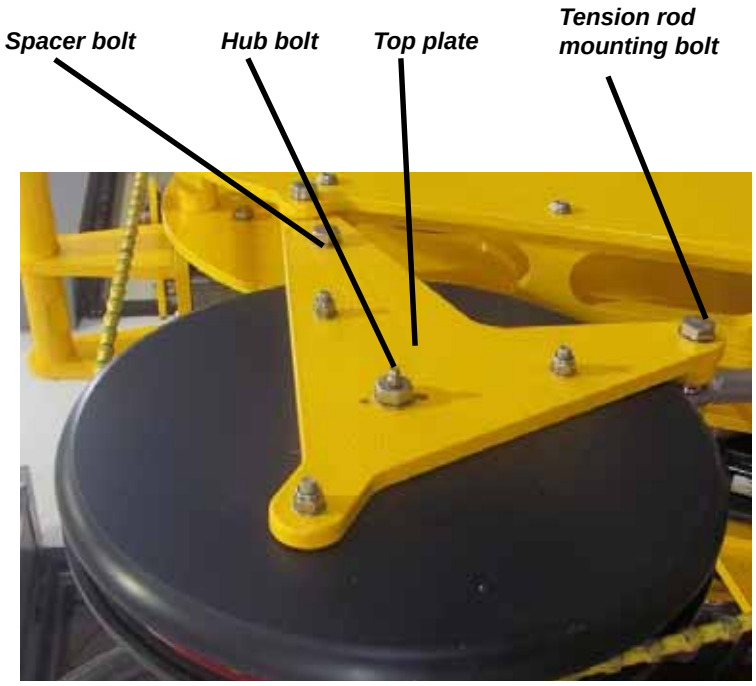


Figure 4-17. Remove the nut (on the bottom) of the tension rod mounting bolt, and remove the bolt.

4. Remove the hub bolt and spacer bolt from the wheel assembly, as shown in Figure 4-17. Be careful not to lose the spacer.

5. Pull the top plate off the wheel.

6. Pull the wheel up off the motor shaft. Note the side of the wheel that mounts onto the motor; the wheel is not reversible.

7. Disassemble the wheel and replace the liner as described in the previous section, “Tension and Idler Wheels”.

8. Replace the wheel on the motor shaft, making sure the correct side is toward the motor.

9. Replace the top plate. Insert the spacer bolt through the spacer and snug it down.

10. Replace the hub bolt and snug it.

11. Replace the tension rod mounting bolt through the plates and tension rod end. Put the nut on the end of the bolt and tighten it securely.

12. Tighten the spacer bolt and hub bolt securely.

13. Slide the wheel and motor assembly plates into place in the saw bow and line up the shoulder screw holes.

14. Insert the shoulder screw through the shoulder screw holes and replace the washer and tighten the nut securely.

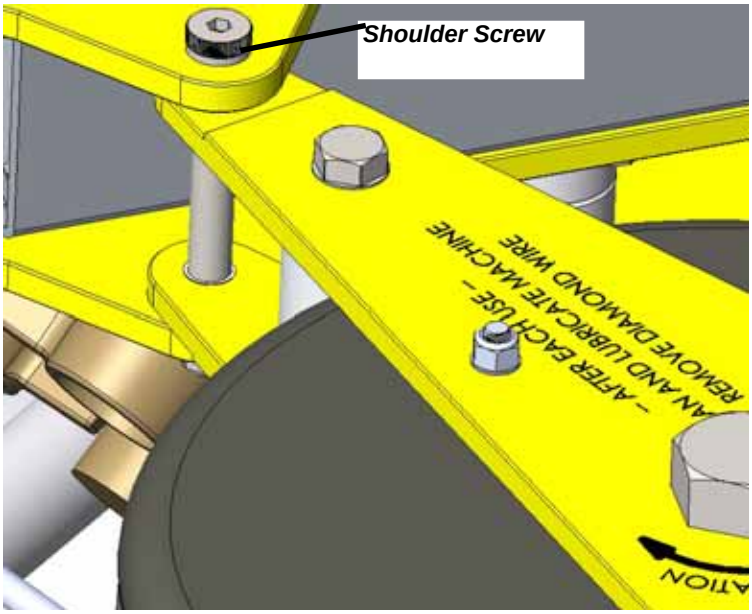


Figure 4-18. Make sure the shoulder screw is through both holes in the plate and tighten a nut with a washer securely.

ADJUSTING THE FEED CONTROL UNIT

If the feed tension control mechanism is not working properly, you will need to adjust the unit. Typically, the problem will be that the system overfeeds, putting too much tension on the wire and potentially breaking it.

For this procedure, you will need to access the Feed Control Unit. Figure 4-19 shows the location of these assembly on the saw.

Figure 4-19. The photo shows the location of the Feed Control Unit on the WS416 saw model. The assembly is in the same location on all models of the diamond wire saw.

1. Position the saw so that the bow is face up

2. Connect a flow meter inline of the bypass (top hose fitting labeled “FEED RETRACT(B)”) Figure 4-20 shows the bypass.

Figure 4-20. The drawing shows the FEED RETRACT (B) circuit.

3. Run the feed in the cut position checking simultaneously checking the flow meter to read 2 to 2-1/2 GPM.

NOTE

The full assembly drawings with parts lists are included in Chapter 5.

4. If the flow does not read 2 to 2-1/2 GPM adjust the flow control valve FDBA-LAN/AP shown in the illustration in figure 4-21.

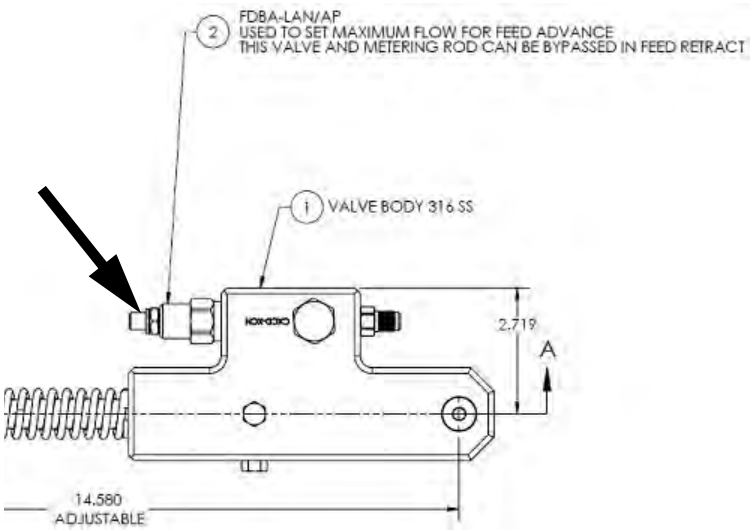


Figure 4-21. The illustration sows the flow control valve FDBA-LAN/AP.

Checking the Stop of the Feed Control

1. Using a nylon strap, install one end onto the diamond wire and secure the other end onto the lifting eyebolt

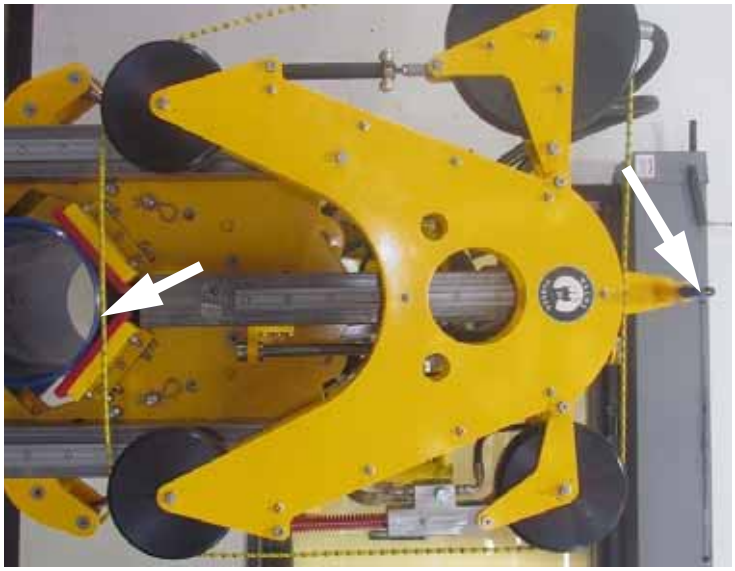


Figure 4-22. Secure the ends of a nylon strap to the diamond wire and lifting eyebolt.

2. Disconnect the hydraulic hoses from the drive motor
3. Engage the feed circuit to the cut position
4. Slowly tighten tighten the nylon strap while watching the feed to slow down.
5. Continue to tighten the nylon strap until the feed comes to a complete stop.
6. If the feed stops, the control unit is functioning properly.
7. If the feed continues to progress then the control unit needs to be replaced.
8. Check the control unit for leaks (Figure 4-23 shows items 9&11 that would require replacement if the unit leaks)

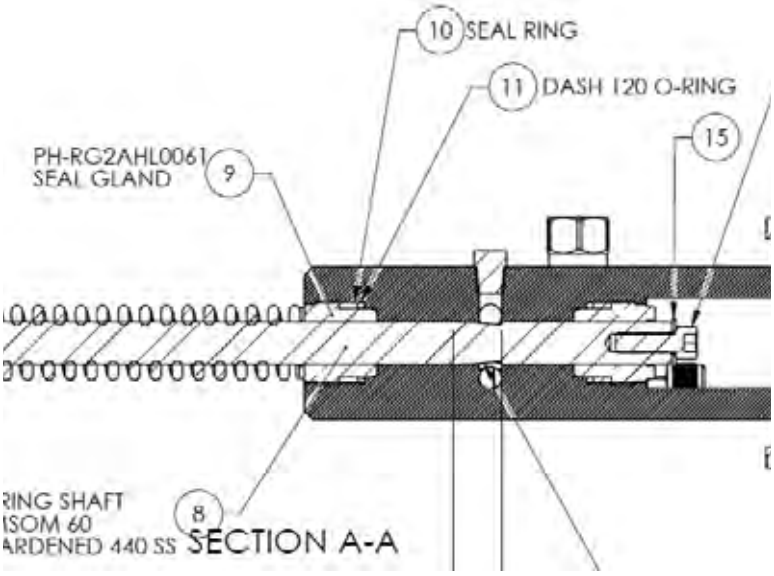


Figure 4-23. The illustration shows the internal seals to be replaced (Items 9 & 11)

Chapter 5

Parts List and Ordering Information

In This Chapter

ORDERING INFORMATION

DRAWINGS AND PARTS LISTS

ORDERING INFORMATION

To place an order, request service, or get more detailed information on any Wachs Subsea LLC products, call us at one of the following numbers:

U.S. 713-983-0784, Houston Office

You can also visit our Web site at:

www.wachssubsea.com

Ordering Replacement Parts

When ordering parts, refer to the parts lists in this chapter. Please provide the part description and part number for all parts you are ordering.

Repair Information

Please call us for an authorization number before returning any equipment for repair or factory service. We will advise you of shipping and handling. When you send the equipment, please include the following information:

- Your name/company name
- Your address
- Your phone number
- A description of the problem or the work to be done.

Before we perform any repair, we will estimate the work and inform you of the cost and the time to complete it.

Warranty Information

Enclosed with the manual is a warranty card. Please fill out the registration card and return to Wachs Subsea LLC. Retain the owner's registration record and warranty card for your information.

Return Goods Address

Return equipment for repair to the following address.

Wachs Subsea LLC
15331 Vantage Pkwy East
Houston, TX 77032 USA

DWDWS Spares

The following spares are recommended for the DWDWS models:

- complete control manifold with cartridges
- flow control valves (cartridges)
- knobs
- knob housings
- knob stop bars
- knob shaft adapters
- flow control clutches
- feed control unit (complete assembly).

Drawings and Parts Lists

The drawings on the following pages illustrate the WS-164 and WS-3616 diamond wire saws. Each assembly drawing includes a parts list; use the part numbers to order spare or replacement parts.

The following tables list the drawings provided for each diamond wire saw model.

Table 1: Common Assemblies—All DWS Models

Drawing Number	Description
10-010-00-412-R1	Planetary Gear Motor
10-010-00-419B	Flow Divider Combiner Valve Assembly
10-010-00-431C-R1	Frame Drive Arm
10-010-00-432C	Lightweight wheel assembly
10-010-00-433B-R1	Tensioning Wheel Assembly
10-010-00-434B-R1	Idler Wheel Assembly
10-010-00-CHAIN	Roller chain
H10-071-200	Drive Assembly Feed Control Unit

Table 2: DWS-1604 Assembly Drawings

Drawing Number	Description
10-010-516-R1	16” DWS
10-010-16-110-LH	Clamp pin fork—LH
10-010-16-110-RH	Clamp pin fork—RH
10-010-16-410-R1	Clamp assembly
10-010-16-411-R1	Feed Frame
10-010-16-413-R1	Lifting Tube
10-010-16-420-R1	Clamp
10-010-16-421-R1	Adjustable clamp with actuator
10-010-16-422-R1	Clamp arm assembly
10-010-16-430-R1	Bow assembly
10-010-16-224B	Bulkhead plate

Table 3: DWDWS-1604 Assembly Drawings

Drawing Number	Description
10-010-516-ROV	16" DWDWS (4 sheets)
10-010-16-430-ROV	Bow assembly
10-010-16-410-ROV	Clamp assembly
10-010-16-420-ROV	Clamp
10-010-16-421-ROV	Clamp with actuator
10-010-16-422-ROV	Clamp arm assembly
H10-084-200-A	ROV interface panel
H10-023-001-SCH	Universal hydraulic manifold schematic
10-010-16-322	Bulkhead assembly

NOTE: Some DWDWS sub-assemblies are the same as those for the standard WS-164. Refer to the drawing section for the standard saw.

Table 4: DWS-3012 Assembly Drawings

Drawing Number	Description
10-010-536-R1	36" DWS
10-010-36-410-R1	Clamp assembly
10-010-36-411-R1	Feed Frame
10-010-36-413-R1	Lifting Tube
10-010-36-420-R1	Clamp
10-010-36-421-R1	Adjustable clamp with actuator
10-010-36-422-R1	Clamp arm assembly
10-010-36-430-R1	Bow assembly
10-010-30-224B	Bulkhead plate

Table 5: DWS-3616 Assembly Drawings

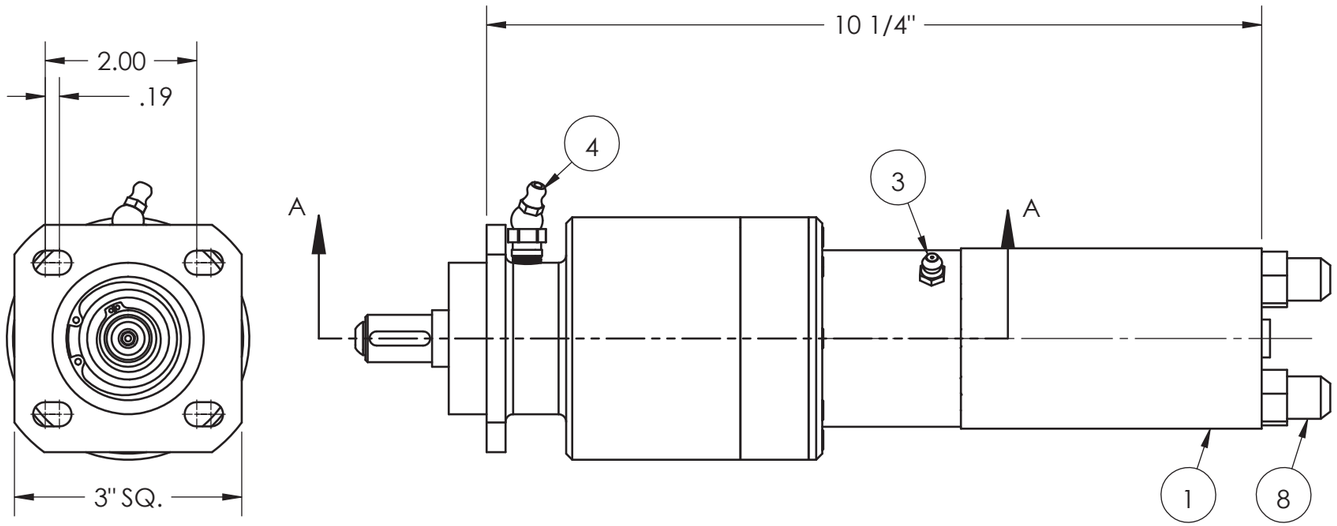
Drawing Number	Description
10-010-536-R1	36” DWS
10-010-36-110-LH	Clamp pin fork—LH
10-010-36-110-RH	Clamp pin fork—RH
10-010-36-410-R1	Clamp assembly
10-010-36-411-R1	Feed Frame
10-010-36-413-R1	Lifting Tube
10-010-36-420-R1	Clamp
10-010-36-421-R1	Adjustable clamp with actuator
10-010-36-422-R1	Clamp arm assembly
10-010-36-430-R1	Bow assembly
10-010-36-224B	Bulkhead plate

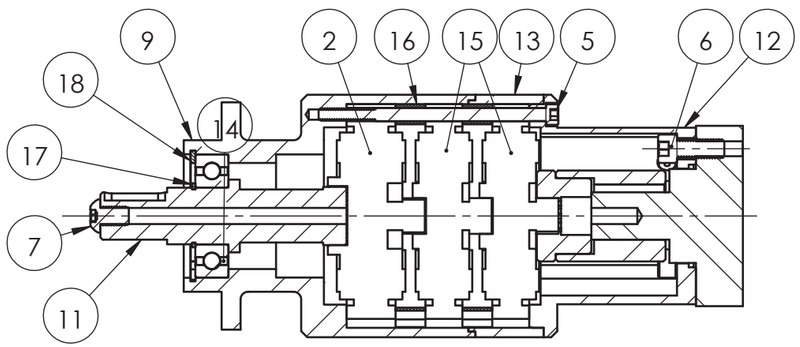
Table 6: DWDWS-3616 Assembly Drawings

Drawing Number	Description
10-010-536-ROV	36” DWDWS General arrangement
10-010-36-410-ROV	Clamp assembly
10-010-36-420-ROV	Clamp
10-010-36-421-ROV	Adjustable clamp with actuator
10-010-36-422-ROV	Clamp arm assembly
10-010-36-430-ROV	Bow assembly
10-010-36-443	Clamp pin assembly
H10-084-200-AA	ROV interface panel
10-010-36-322	Bulkhead assembly

Table 7: DWS-5230 Assembly Drawings

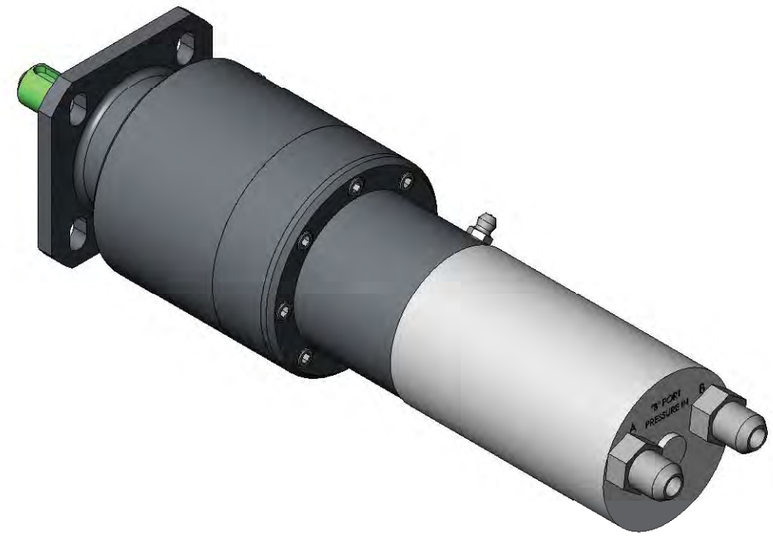
Drawing Number	Description
10-010-552-R1	52" DWS
10-010-52-110-LH	Clamp pin fork—LH
10-010-52-110-RH	Clamp pin fork—RH
10-010-52-410-R1	Clamp assembly
10-010-52-411-R1	Feed Frame
10-010-52-413-R1	Lifting Tube
10-010-52-420-R1	Clamp
10-010-52-421-R1	Adjustable clamp with actuator
10-010-52-422-R1	Clamp arm assembly
10-010-52-430-R1	Bow assembly
10-010-52-224B	Bulkhead plate





SECTION A-A

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	11-092-00	MOTOR, FEED, EATON 129-0002-002	1
2	11-103-00	PLANETARY GEAR, MATEX, 4MLG12	1
3	1293K21	1/4-28 GREASE FITTING; SS	1
4	1292K37	1/8 NPT x 1 1/4 TALL 30 DG GREASE ZERK	1
5	92196A209	SHCS #8-32 x 3" LG.	7
6	92196A319	SHCS 1/4"-28 x 5/8" LG, SS	5
7	92949A560	BSCHS 1/4"-28x3/8" LG, SS	1
8	Brennan 6400-06-06-O	MJ-MORB STRAIGHT CONNECTOR	2
9	P06-052-150	HOUSING, FEEDBOX OUTPUT	1
10	P06-052-155-R1	COUPLER, MOTOR	1
11	P06-052-158	COUPLER, DRIVE	1
12	P06-052-159	HOUSING, FEEDBOX INPUT	1
13	P06-052-333	ADAPTER, FEED MOTOR	1
14	P06-150-035	60355K603 BEARING .75 X 1.62 X .43	1
15	P06-150-036	PLANETARY GEAR, MATEX, 3MLD8	2
16	P06-150-037	SPACER, GEAR, MATEX, U75-913	2
17	5100-75 -H	TRUARC RETAINING RING, SS, 3/4"	1
18	N5000-162-H	TRUARC RETAINING RING, SS, 1 5/8"	1



REV.	DESCRIPTION	DATE	APR.
2	PART NUMBER CHANGED	7/30/2010	AG
1	PRODUCTION RELEASE	11/12/2009	KRP

REVISION HISTORY

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THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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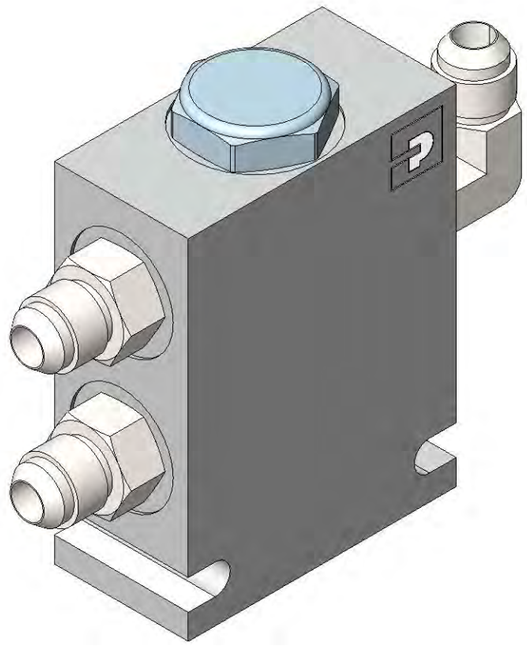
E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: PLANETARY GEAR MOTOR

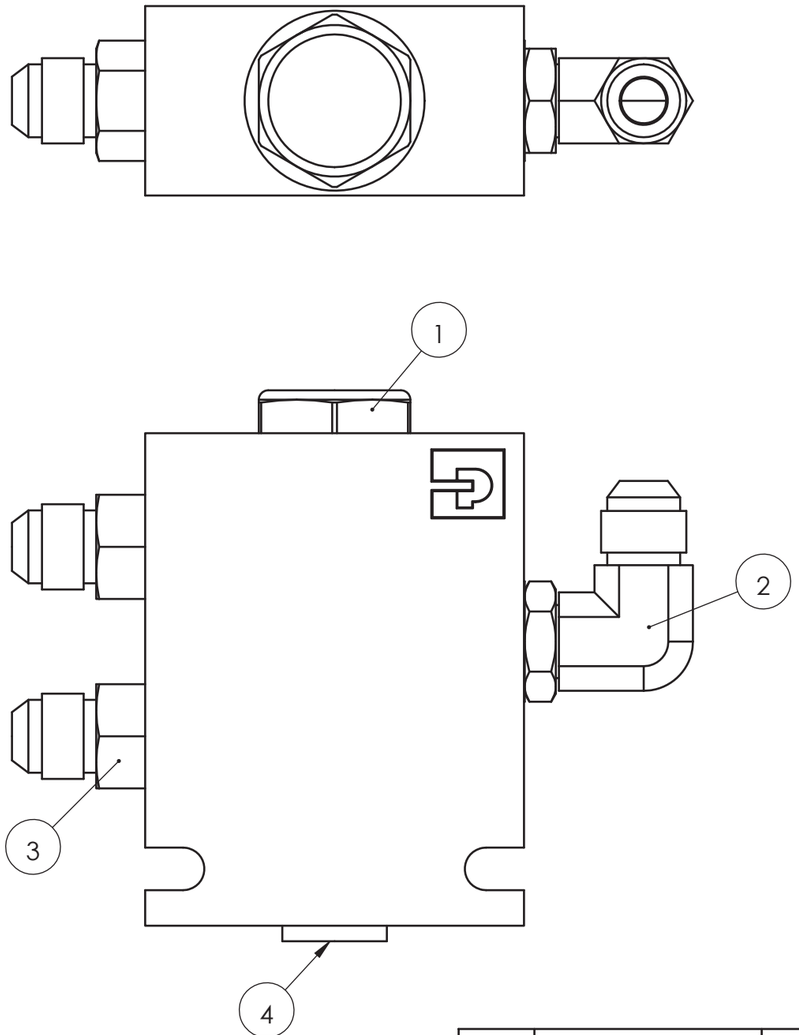
DRAWN BY	APPROVED BY	SCALE
AG	.	1:2
DATE	DATE	SHEET
10/27/09	.	1 OF 1

SIZE	DWG. NO.	REV.
B	10-010-00-412-R1	2

NOTES:
1. MATERIAL: PURCHASED
2. FINISH: NONE



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-004B	Flow Divider Combiner Valve	1
2	Parker 6_C5OX-S	-6 SAE to -6 JIC 90 deg Elbow	1
3	Parker 6_F5OX-S	-6 SAE to -6 JIC Straight Fitting	2
4	PARKER #6_HP5ON-SS	-6 SAE PLUG	1



REV.	DESCRIPTION	DATE	APR.
1	Released For Production	5/14/2010	Karl K

REVISION HISTORY

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THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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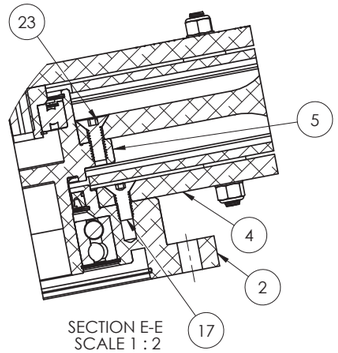
E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

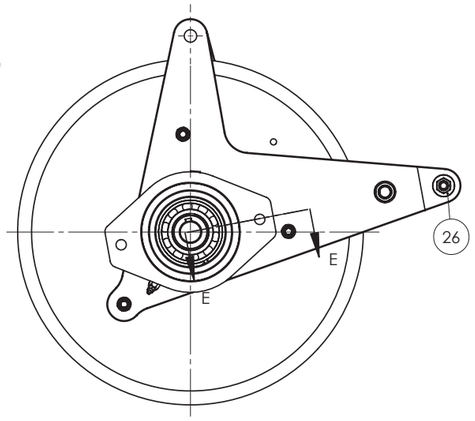
TITLE: Flow Divider Combiner Valve Assembly

DRAWN BY	APPROVED BY	SCALE
Karl K	KRP	1:1
DATE	DATE	SHEET
5/13/2010	5/13/2010	1 OF 1

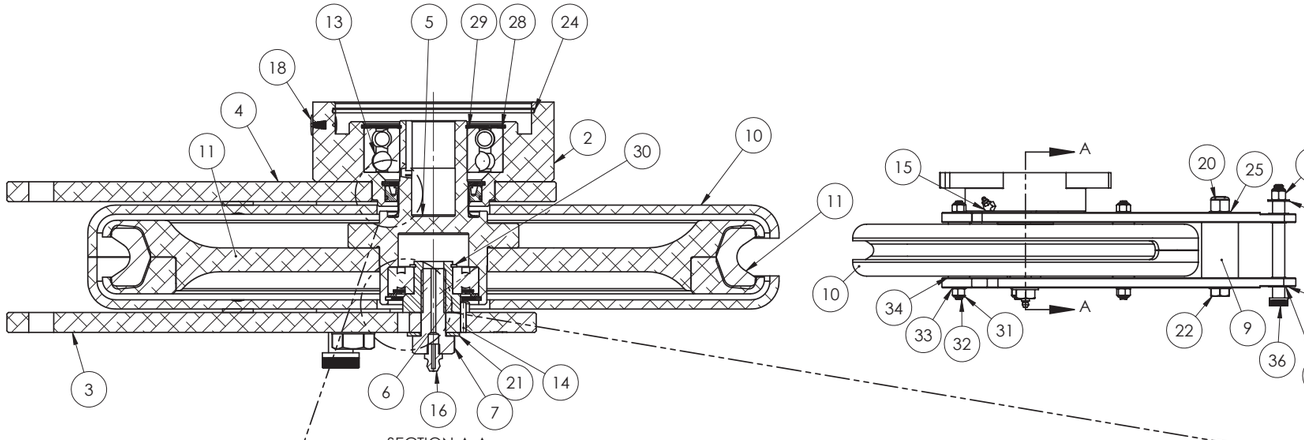
SIZE	DWG. NO.	REV.
B	**10-010-00-419B**	1



SECTION E-E
SCALE 1 : 2

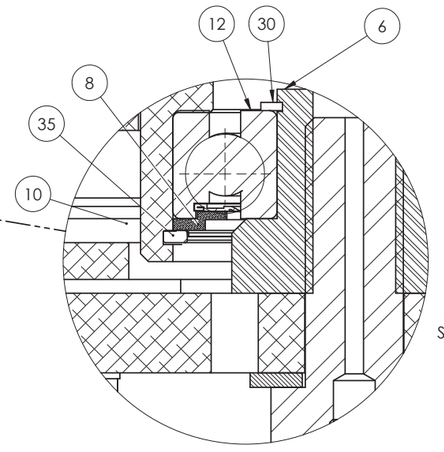


ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-002	ROTARY SEAL	1
2	10-010-00-037A	BLOCK, MOTOR ADAPTER	1
3	10-010-00-043C-R1	PLATE, 033B-R1	1
4	10-010-00-043E-R1	MOTOR SIDE PLATE, 043E-R1	1
5	10-010-00-050B	ASSY, HUB, DRIVE WHEEL	1
6	10-010-00-051	MOUNT, BEARING	1
7	10-010-00-059	SCREW, 059 WHEEL	1
8	10-010-00-064	RETAINER, DRIVE WHEEL SEAL	1
9	10-010-00-076-R1	ROD, 044-R1	1
10	10-010-00-280B-R1	WHEEL COVER 280B-R1	2
11	10-010-00-432C	WHEEL ASSEMBLY, LIGHTWEIGHT	1
12	SS-6204-1RS	BALL BEARING, SS	1
13	4207_ATN9	DOUBLE ROW BALL BEARING	1
14	90145A539	1/4 x 5/8 LG. DOWEL PIN	3
15	1293K23	45 Degree Grease Fitting, 1/4-28	1
16	1293K21	1/4-28 GREASE FITTING; SS	1
17	90585A581	FHCS, 5/16-18 X 3/4" (316 SS)	6
18	9171K251	1/8" NPT HEX PIPE PLUG	1
19	91831A127	NUT, 3/8-16 SS NYLOCK	1
20	91831A137	LOCKNUT 1/2"-13, SS	1
21	91950A033	1/2 WASHER, SS	1
22	92198A753	HHCS 1/2"-13x3.75" LG, SS	1
23	92210A584	FHCS, 5/16"-18 X 7/8" LNG., SS	6
24	9452K134	-45 O-RING BUNA N 70	1
25	98017A209	1/2 WASHER, SS	2
26	Garlock 08FDU06	BUSHING	2
27	Smalley EH_50	RETAINING RING FOR 50MM BORE	1
28	Smalley EH_72	RETAINING RING FOR 72 MM BORE	1
29	Smalley WS_137	RETAINING RING FOR 35MM SHAFT	1
30	Truarc 5108-78-H	RETAINING RING	1
31	91831A030	LOCKNUT 5/16"-18, SS	6
32	92210A582	FSHCS 5/16"-18 x 1.125" LG, SS	6
33	98017A689	5/16" WASHER, SS	6
34	93286A030	5/16" WASHER, AL.	6
35	Smalley WHT-185-S02	RETAINING RING	1
36	90298A728	1/2 x 4 SHOULDER SCREW	1
37	98017A210	1/2 IN WASHER	1

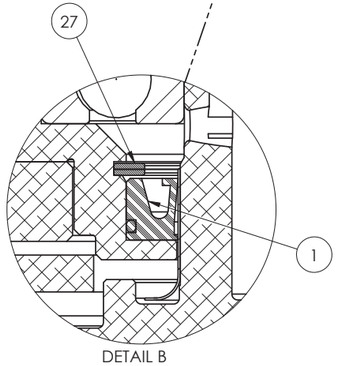


SECTION A-A
SCALE 1 : 2

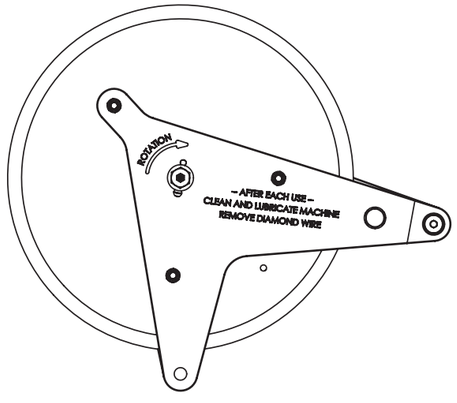
Pass a .501 ball through the bushings after they are pressed into the plates



DETAIL D
SCALE 2 : 1



DETAIL B
SCALE 2 : 1



REV.	DESCRIPTION	DATE	APR.
1	Released For Production	3/21/2011	KarlK

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TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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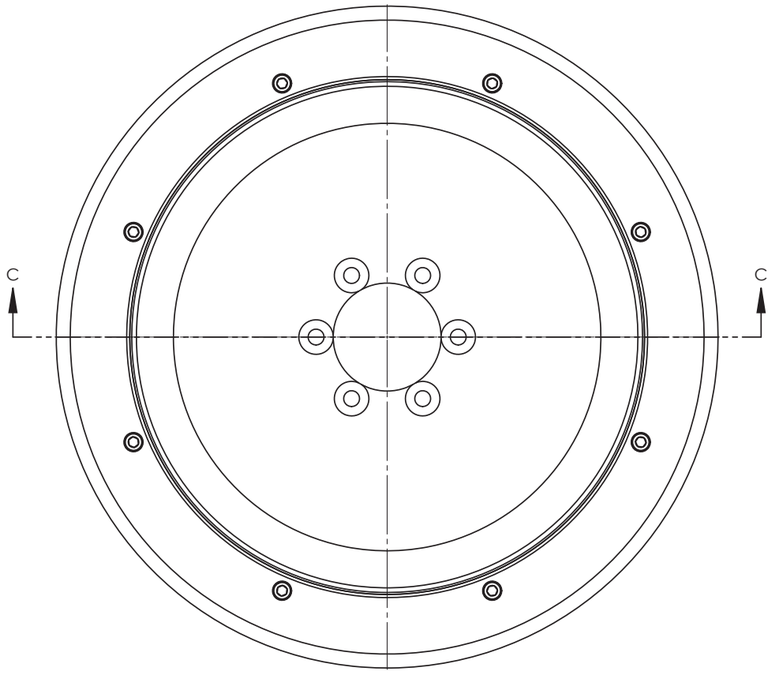
E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

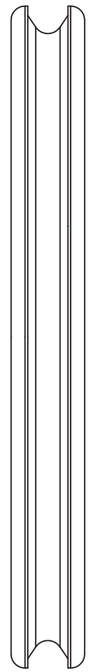
TITLE: FRAME DRIVE ARM

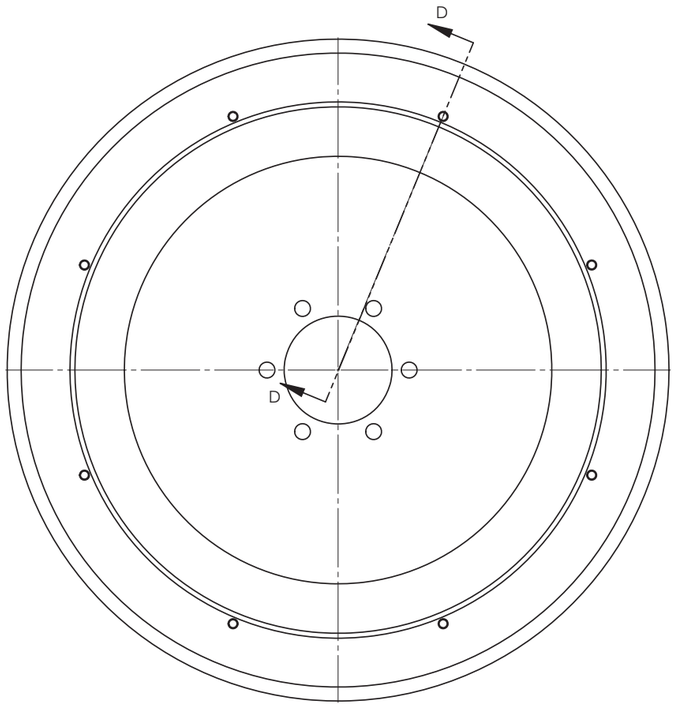
DRAWN BY	APPROVED BY	SCALE
JPW	KRP	1:4
DATE	DATE	SHEET
08/11/10	08/11/10	1 OF 1

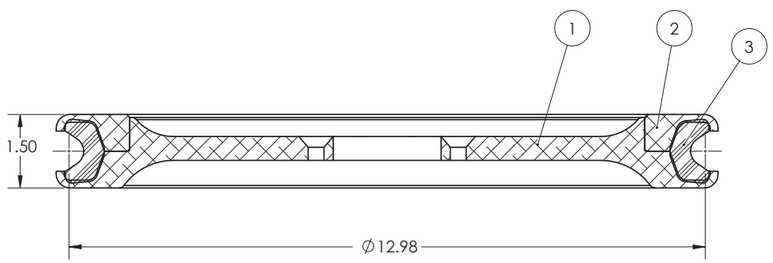
SIZE	DWG. NO.	REV.
C	10-010-00-431C-R1	1

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-053L	WHEEL, 053 F	1
2	10-010-00-053G	WHEEL, 053 G	1
3	10-010-00-720	LINER, WHEEL	1
4	92196A544	1/4-20 x 1.250lg SS SHCS	8

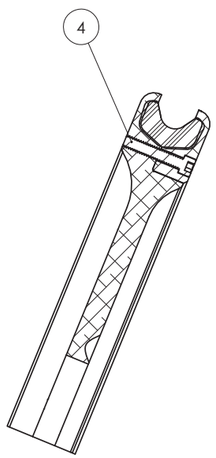








SECTION C-C



SECTION D-D

REV.	DESCRIPTION	DATE	APR.
1	RELEASED FOR PRODUCTION	10/4/2010	KRP
0	PROTOTYPE RELEASE RELEASE	8/12/2010	JPW

REVISION HISTORY

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TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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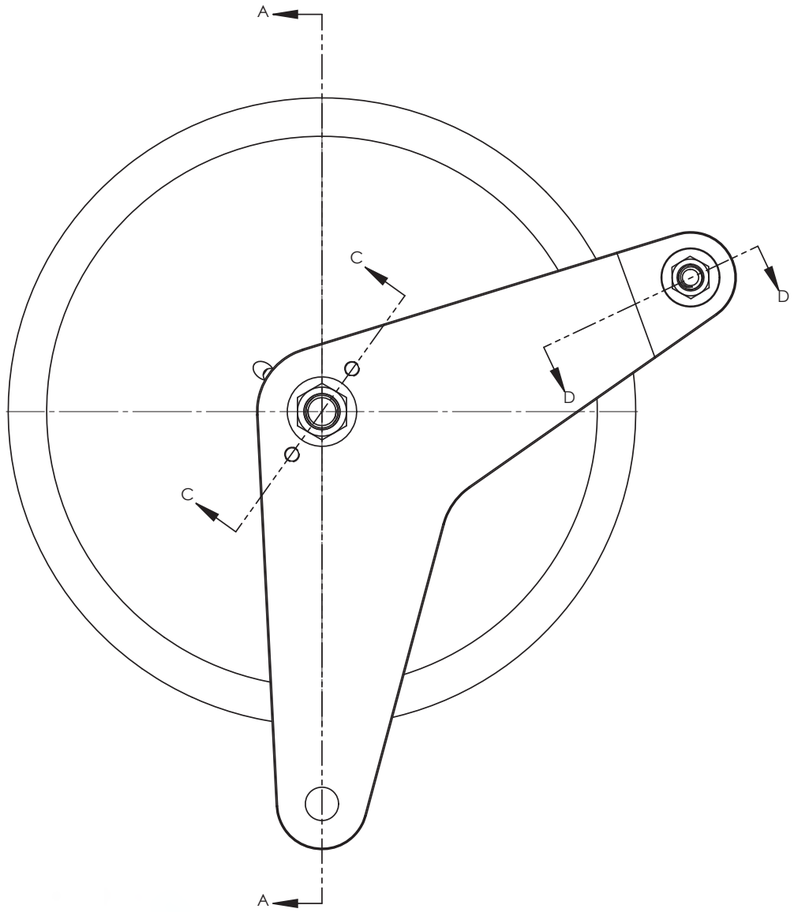
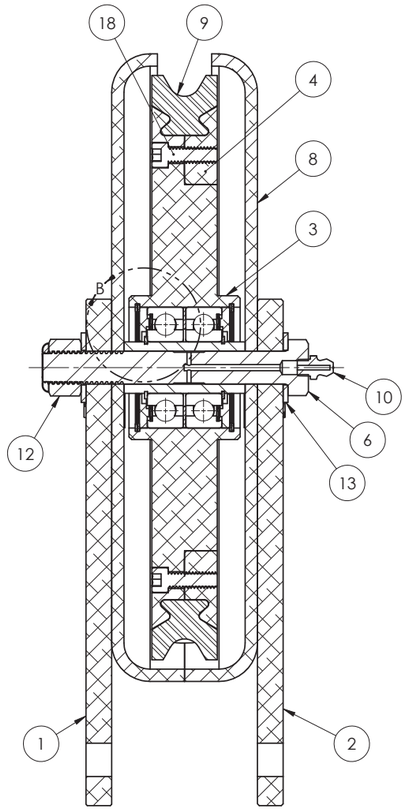
E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: WHEEL ASSEMBLY, LIGHTWEIGHT

DRAWN BY	APPROVED BY	SCALE
JPW	KRP	1:2
DATE 08/11/10	DATE 08/11/10	SHEET 1 OF 1

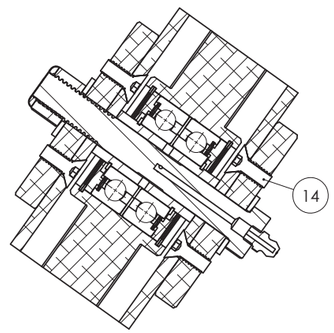
SIZE	DWG. NO.	REV.
C	10-010-00-432C	B



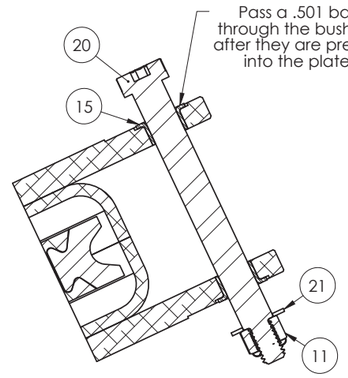


SECTION A-A

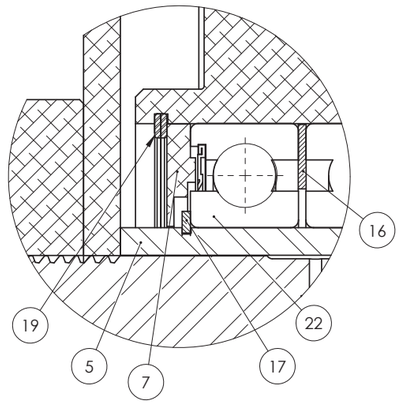
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-032-R1	PLATE, 032-R1	1
2	10-010-00-032B-R1	PLATE, 032B-R1	1
3	10-010-00-052B	HUB, WHEEL	1
4	10-010-00-052C	HUB, WHEEL	1
5	10-010-00-055B	TUBE, 055B	1
6	10-010-00-057	HHCS, 1/2-13 X 3-3/4" (316 SS)	1
7	10-010-00-063	RETAINER, GUIDE WHEEL SEAL	2
8	10-010-00-281-R1	COVER, GUIDE WHEEL	2
9	10-010-00-730C	GRIP, WHEEL IDLER	1
10	1293K21	1/4-28 GREASE FITTING; SS	1
11	91831A127	NUT, 3/8-16 SS NYLOCK	1
12	91831A137	LOCKNUT 1/2"-13, SS	1
13	91950A033	1/2 WASHER, SS	2
14	92210A539	FHSCS 1/4"-20x5/8"LG, SS	4
15	Garlock 08FDU06	BUSHING	2
16	Timken FTRA-3047	WASHER, THRUST	1
17	Truarc 5108-78-H	RETAINING RING	2
18	92196A540	SHCS, 1/4"-20 X 3/4" LNG., SS	8
19	Smalley WHT-185-S02	RETAINING RING	2
20	90298A728	1/2 x 4 SHOULDER SCREW	1
21	98017A210	1/2 IN WASHER	1
22	SS-6204-1RS	BALL BEARING, SS	2



SECTION C-C



SECTION D-D



DETAIL B
SCALE 2 : 1

REV.	DESCRIPTION	DATE	APR.
1	Released For Production	3/21/2011	KarlK

REVISION HISTORY

UNLESS OTHERWISE SPECIFIED:
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E.H. WACHS WORKMANSHIP STANDARDS (WI 17-01) SHALL APPLY TO ALL ITEMS NOT SPECIFIED ON DRAWING.
DO NOT SCALE DRAWING.

TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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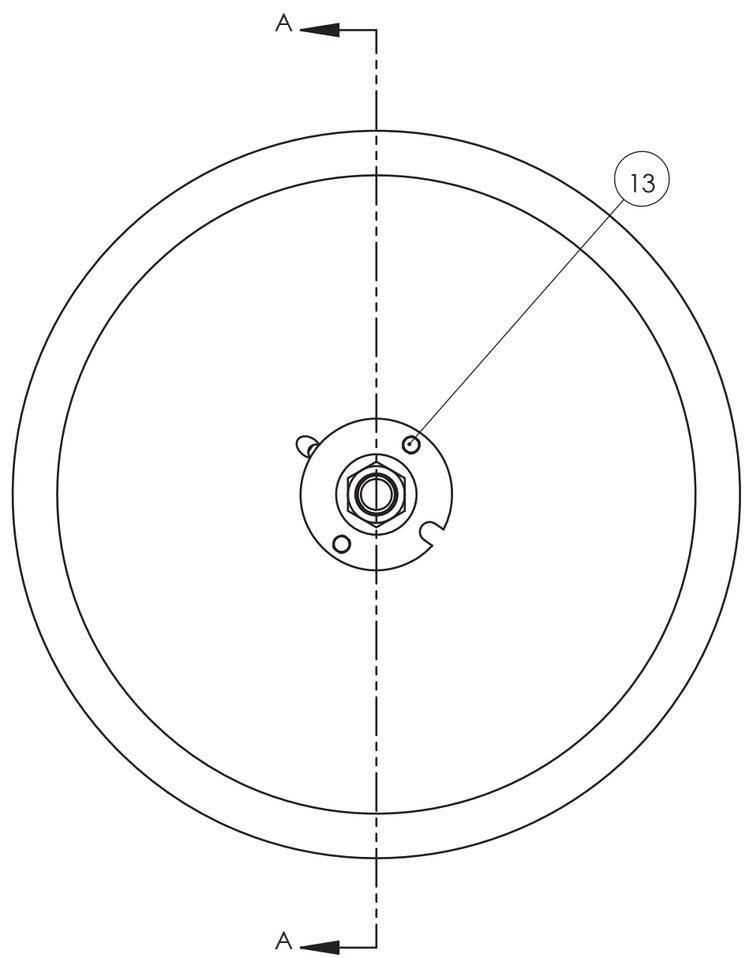
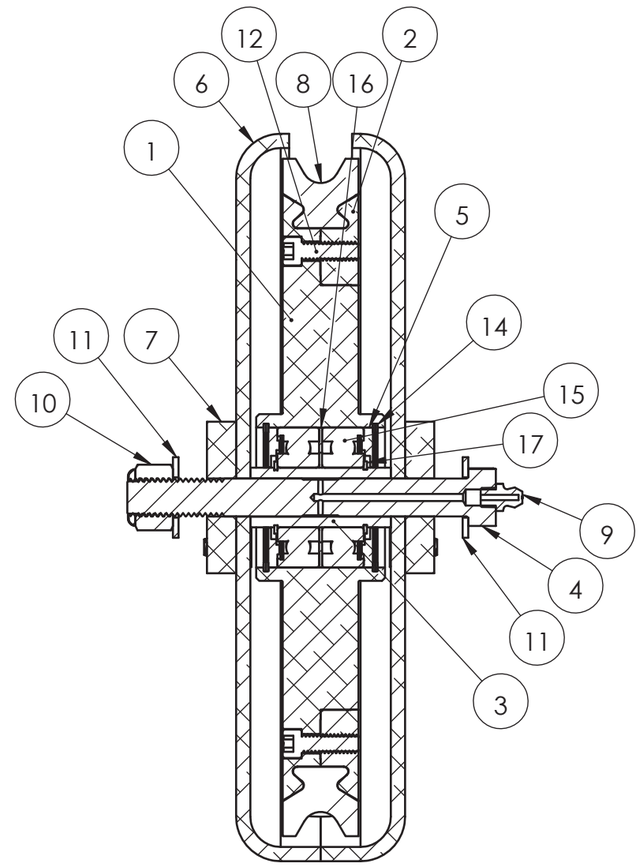
E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE	ASSY, TENSIONING WHEEL
DRAWN BY	JPW
APPROVED BY	KRP
SCALE	2:3
DATE	8/12/10
DATE	8/12/10
SHEET	1 OF 1
SIZE	C
DWG. NO.	10-010-00-433B-R1
REV.	1

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-052B	HUB, WHEEL	1
2	10-010-00-052C	HUB, WHEEL	1
3	10-010-00-055B	TUBE, 055B	1
4	10-010-00-058	RADIAL BALL BEARING	1
5	10-010-00-063	RETAINER, GUIDE WHEEL SEAL	2
6	10-010-00-281-R1	COVER, GUIDE WHEEL	2
7	10-010-00-282	BLOCK, 282	2
8	10-010-00-730C	GRIP, WHEEL IDLER	1
9	1293K21	1/4-28 GREASE FITTING; SS	1
10	91831A137	LOCKNUT 1/2"-13, SS	1
11	91950A033	1/2 WASHER, SS	2
12	92196A540	SHCS, 1/4"-20 X 3/4" LNG., SS	8
13	92210A539	FHSCS 1/4"-20x5/8"LG, SS	4
14	Smalley WHT-185-S02	RETAINING RING	2
15	92198A730	1/2-13X4-1/2 HHCS	2
16	Timken FTRA-3047	WASHER, THRUST	1
17	Truarc 5108-78-H	RETAINING RING	2





SECTION A-A

REV.	DESCRIPTION	DATE	APR.
1	Released For Production	3/21/2011	KarlK

REVISION HISTORY

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SHALL APPLY TO ALL ITEMS NOT SPECIFIED ON DRAWING.
DO NOT SCALE DRAWING.

TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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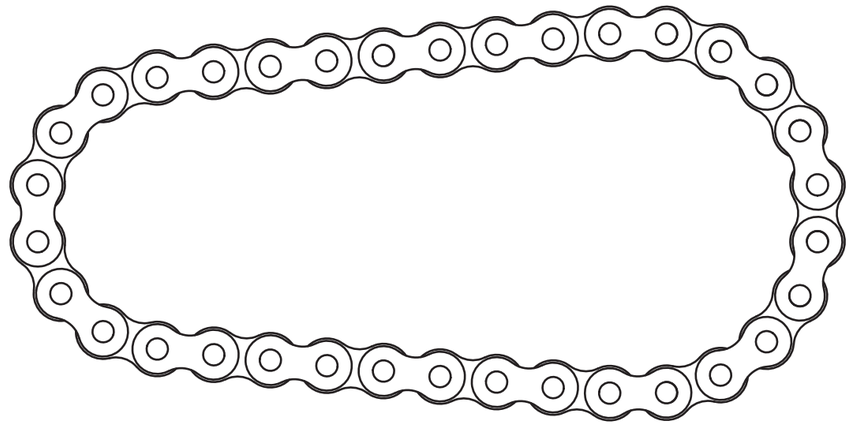
E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: ASSY, IDLER WHEEL

DRAWN BY	APPROVED BY	SCALE
JPW	KRP	1:2
DATE	DATE	SHEET
08/12/10	08/12/10	1 OF 1

SIZE	DWG. NO.	REV.
B	**10-010-00-434B-R1**	1



#35 chain SS
- 34 pitches
- 12.75 long
- Standard type "C" connecting link
- Mcmaster Carr per foot chain stock #6264K84

REV.	DESCRIPTION	DATE	APR.
1	Released For Production	10/4/2011	Karl K

REVISION HISTORY

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TOLERANCES:
FRACTIONS ±1/32
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TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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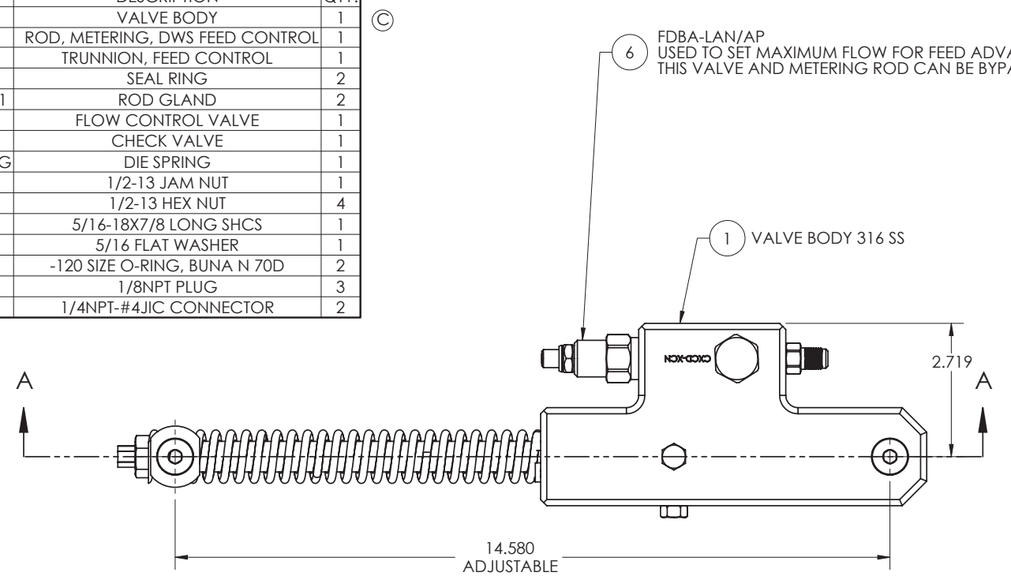
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

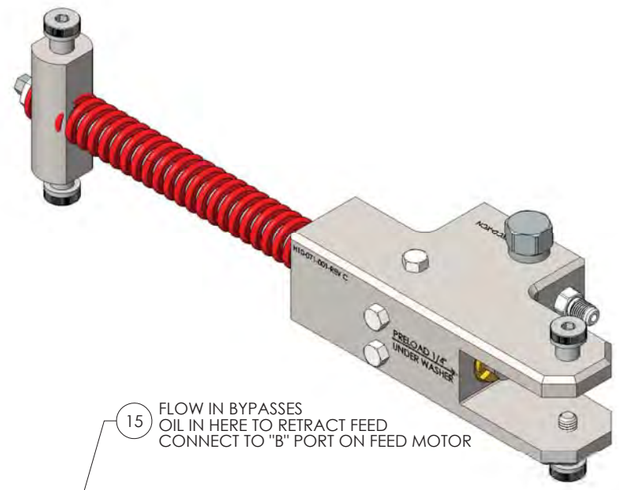
TITLE: ROLLER CHAIN #35-SS

DRAWN BY	APPROVED BY	SCALE
Karl K	KRP	1:1
DATE	DATE	SHEET
10/4/2011	10/4/2011	1 OF 1

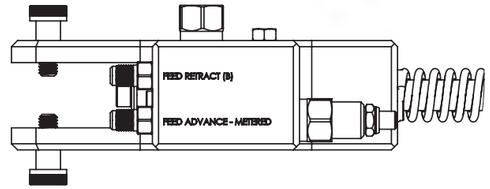
SIZE	DWG. NO.	REV.
B	**10-010-00-CHAIN**	1

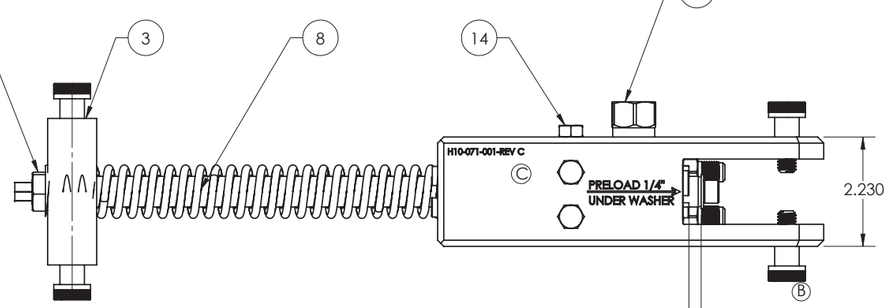
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	H10-071-001	VALVE BODY	1
2	H10-071-002	ROD, METERING, DWS FEED CONTROL	1
3	H10-071-003	TRUNNION, FEED CONTROL	1
4	H10-071-006	SEAL RING	2
5	PH-RG2AHL0061	ROD GLAND	2
6	fdba-lan	FLOW CONTROL VALVE	1
7	cxcd-xcn	CHECK VALVE	1
8	9624K270 SPRING	DIE SPRING	1
9	91847A520	1/2-13 JAM NUT	1
10	97345A700	1/2-13 HEX NUT	4
11	92185A582	5/16-18X7/8 LONG SHCS	1
12	91950A030	5/16 FLAT WASHER	1
13	9452K84	-120 SIZE O-RING, BUNA N 70D	2
14	4443K721	1/8NPT PLUG	3
15	4-4 FTX	1/4NPT-#4JIC CONNECTOR	2

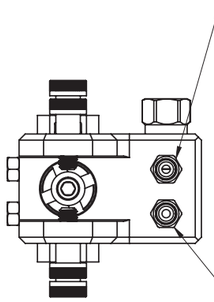




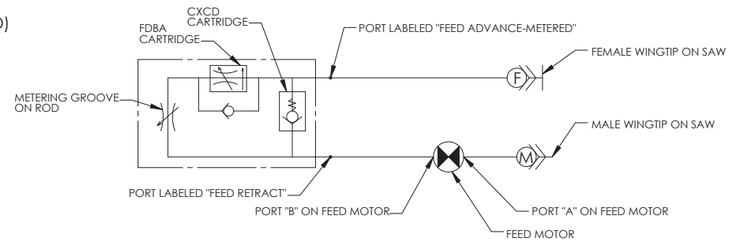
15 FLOW IN BYPASSES
OIL IN HERE TO RETRACT FEED
CONNECT TO "B" PORT ON FEED MOTOR

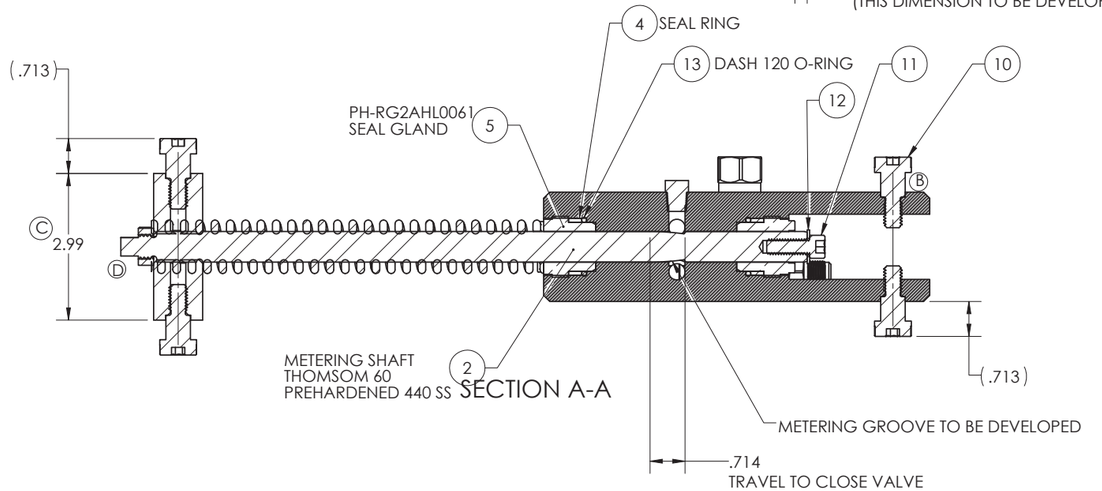






15 FLOW IN METERED
OIL IN HERE TO ADVANCE FEED
CONNECTS TO FEMALE FEED QD ON PANEL





REV.	DESCRIPTION	DATE	APR.
D	JAM NUT AND ROD END CHANGED FOR MORE CLEARANCE	3/28/2011	
C	BOM ADDED, TRUNNION SHORTENED, SHOULDER BOLTS ADDED	12/30/2010	
B	FASTENER FEATURE CHANGED TO SUIT SHOULDER BOLTS, PRE-LOAD DIMENSION CHANGED TO 1/4"	12/22/2010	
A	RELEASED FOR PROTOTYPE	10/26/2010	

REVISION HISTORY

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TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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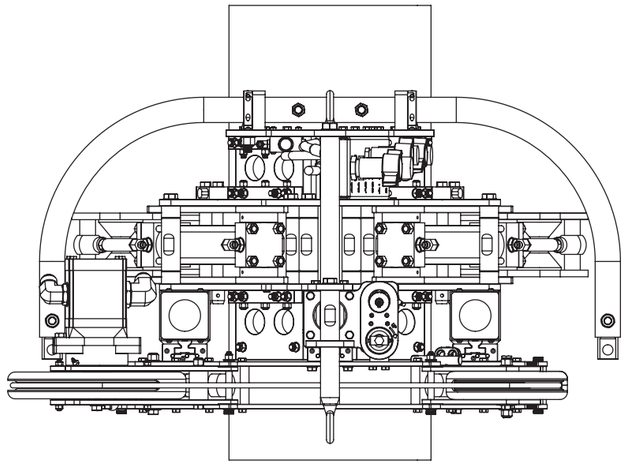
WACHS SUBSEA
11050 West Little York, Building N
Houston, TX 77041
www.wachssubsea.com

TITLE: DWS FEED CONTROL UNIT

DRAWN BY	APPROVED BY	SCALE
RL	---	1:2
DATE 9/22/10	DATE ---	SHEET 1 OF 1

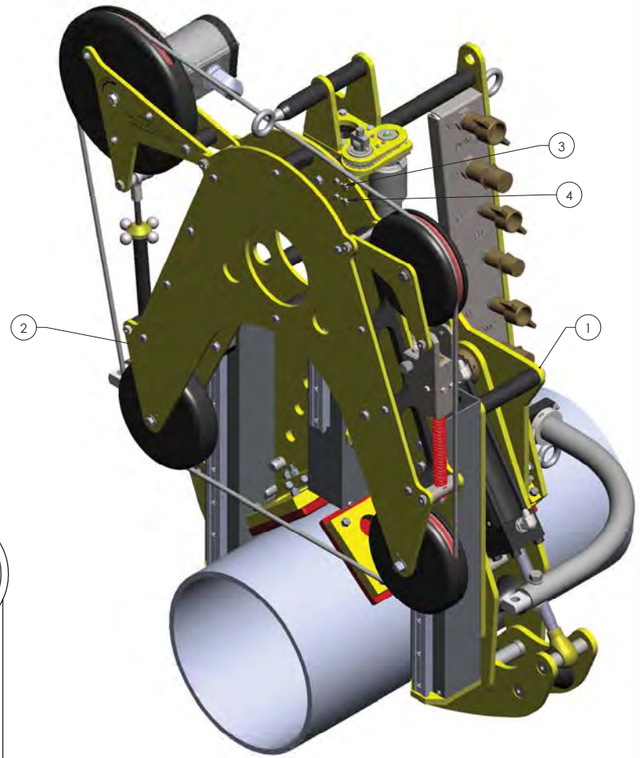
SIZE	DWG. NO.	REV.
C	H10-071-200	D

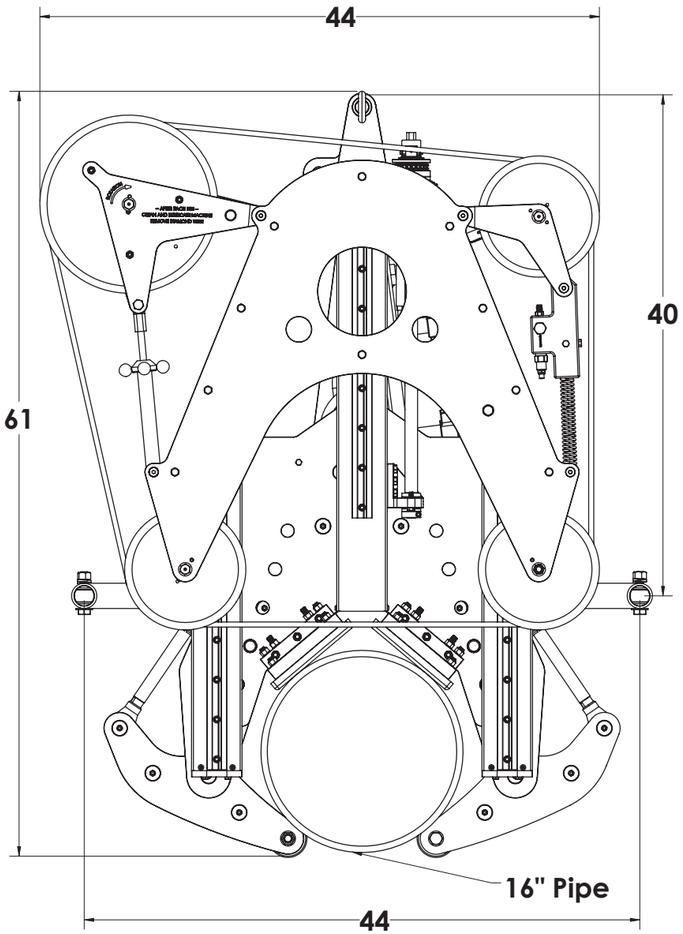
ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	10-010-16-410-R1	DWS 416 CLAMP ASSEMBLY	1
2	10-010-16-430-R1	DWS 416 BOW ASSEMBLY	1
3	92240A623	HHCS 3/8"-16x7/8" LG,SS	4
4	98017A199	3/8" WASHER, SS	4

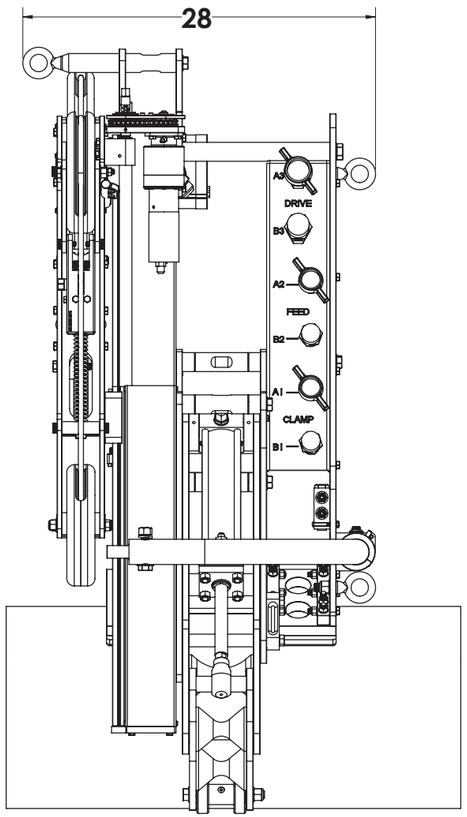


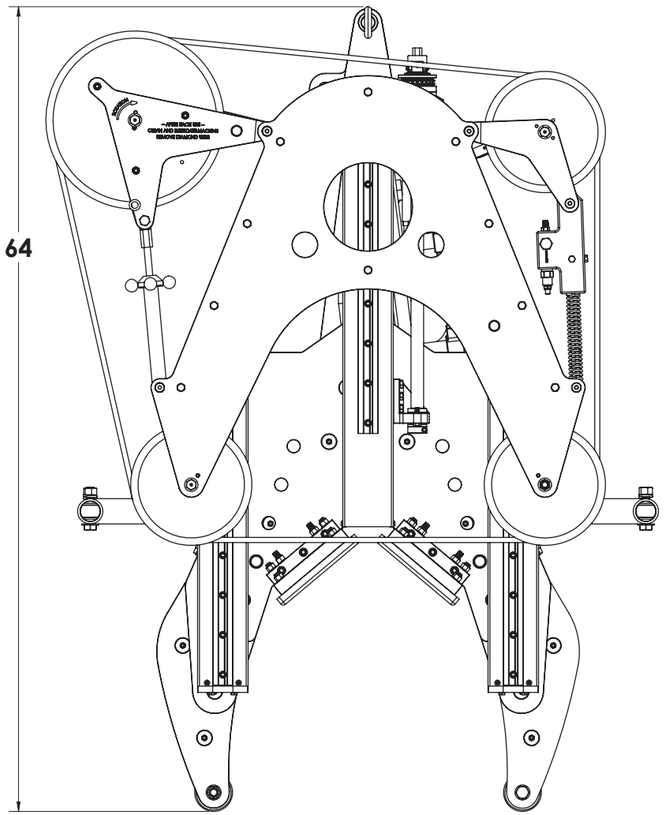
Approx. Weight in Air - 600 lbs.

Approx. Weight in Water - 430 lbs.









REV.	DESCRIPTION	DATE	APR.
REVISION HISTORY			

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THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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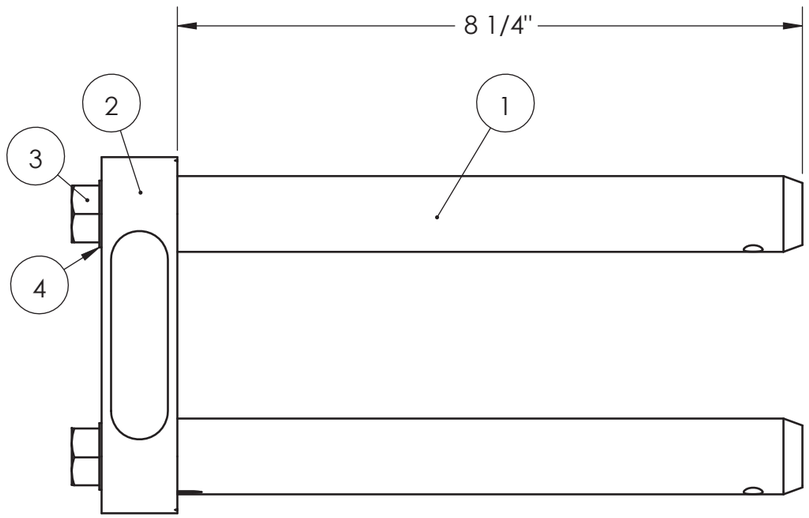
WACHS SUBSEA
11050 West Little York, Building N
Houston, TX 77041
www.wachssubsea.com

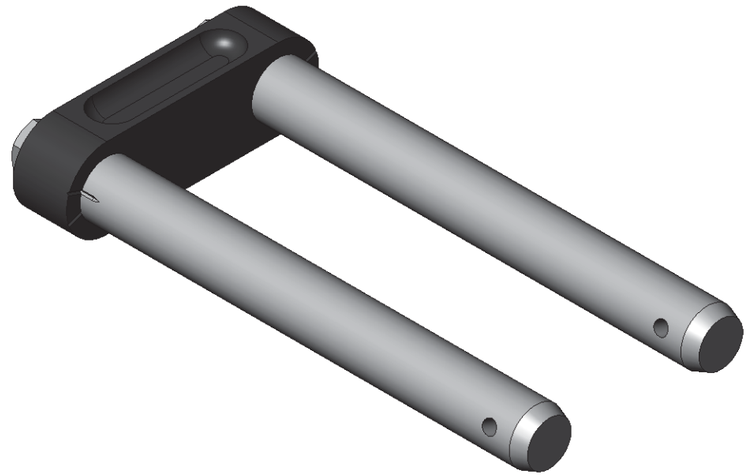
TITLE: 16" Saw on 16" Pipe

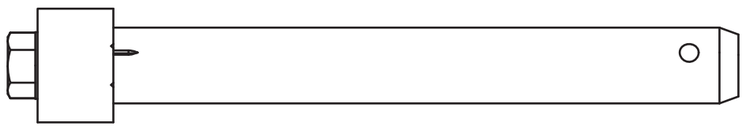
DRAWN BY	APPROVED BY	SCALE
JB	Karl K.	1:24
DATE: 7/11/2013	DATE: 7/12/2013	SHEET: 1 OF 3

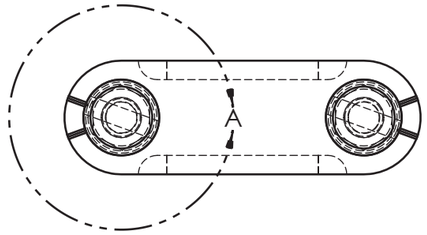
SIZE: D | DWG. NO: 10-010-516-R1 | REV.

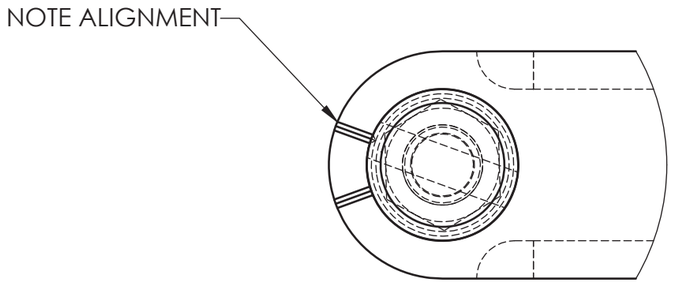
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-230	ROD, 230	2
2	10-010-16-231	BLOCK, 231	1
3	92240A713	HHCS 1/2-13 x 1.125" LG, SS	2
4	98017A209	1/2 WASHER, SS	2











DETAIL A
SCALE 1 : 1

REV.	DESCRIPTION	DATE	APR.
1	RELEASED FOR PRODUCTION	8/18/2010	JPW

REVISION HISTORY

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ONE PLACE DECIMAL ±.015
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THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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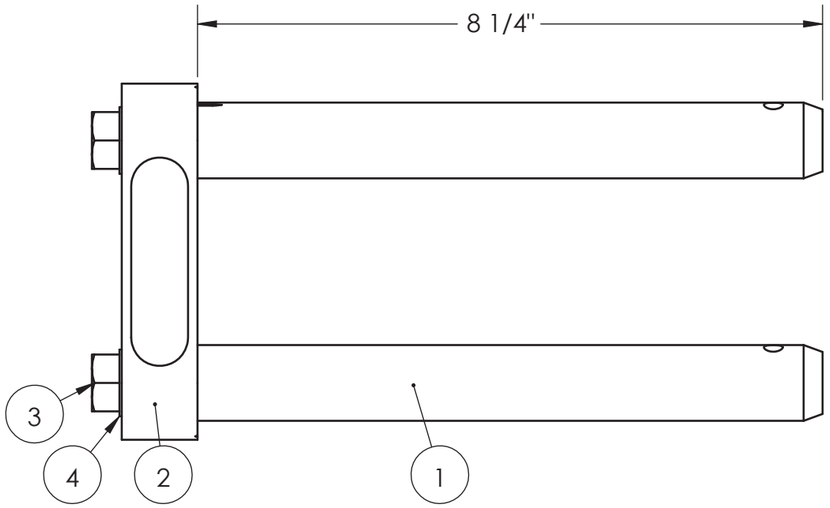
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

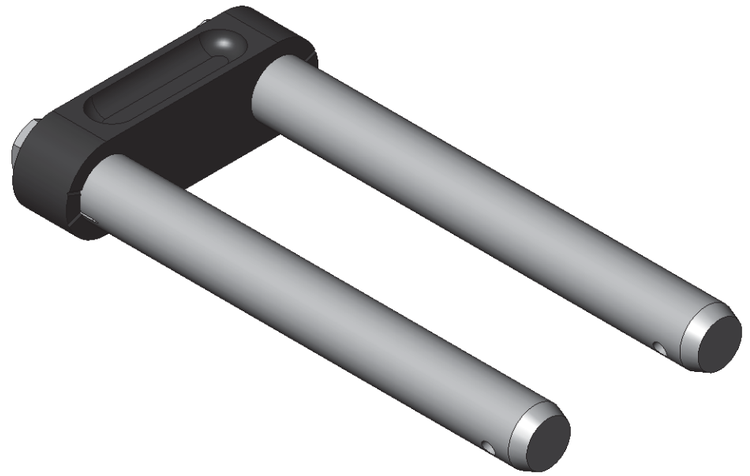
TITLE: CLAMP PIN FORK - LH

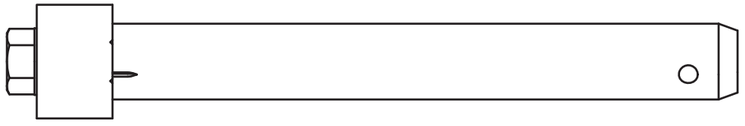
DRAWN BY	APPROVED BY	SCALE
J. WILLIAMS	KRP	1:2
DATE: 08/18/10	DATE: 08/18/10	SHEET: 1 OF 1

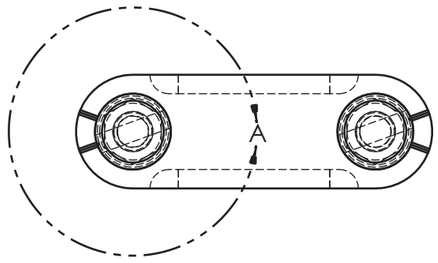
SIZE	DWG. NO.	REV.
B	**10-010-16-110-LH**	1

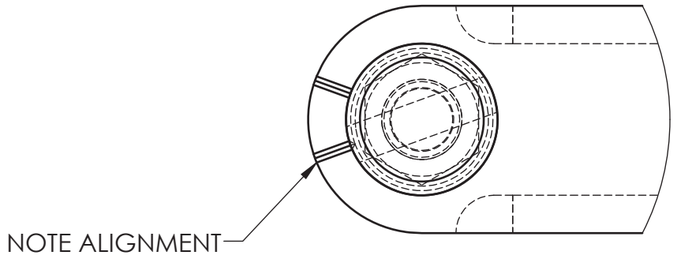
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-230	ROD, 230	2
2	10-010-16-231	BLOCK, 231	1
3	92240A713	HHCS 1/2-13 x 1.125" LG, SS	2
4	98017A209	1/2 WASHER, SS	2











DETAIL A
SCALE 1 : 1

REV.	DESCRIPTION	DATE	APR.
1	RELEASED FOR PRODUCTION	8/18/2010	JPW

REVISION HISTORY

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THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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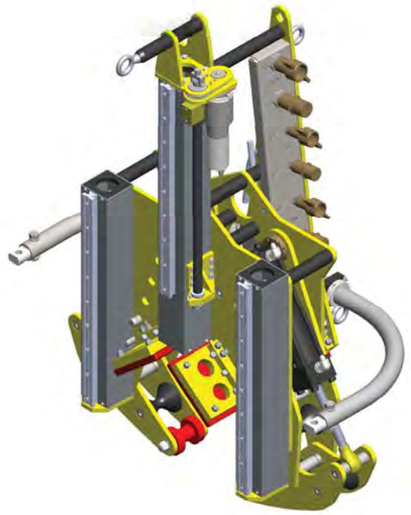
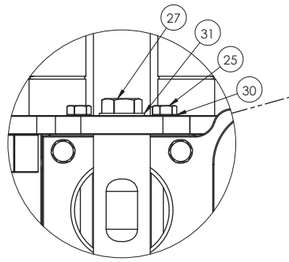
E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: CLAMP PIN FORK - RH

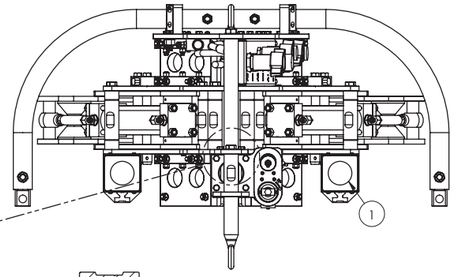
DRAWN BY	APPROVED BY	SCALE
J. WILLIAMS	KRP	1:2
DATE: 08/18/10	DATE: 08/18/10	SHEET: 1 OF 1

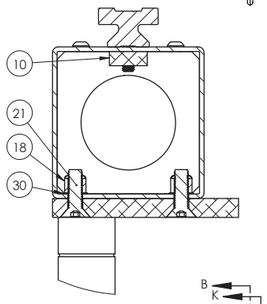
SIZE	DWG. NO.	REV.
B	**10-010-16-110-RH**	1



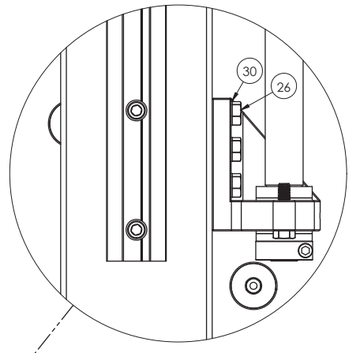


DETAIL E
SCALE 1 : 2

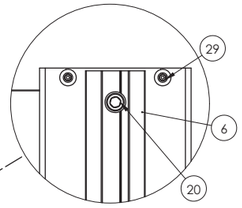




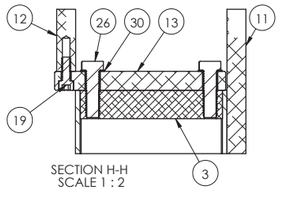
SECTION J-J
SCALE 1 : 2



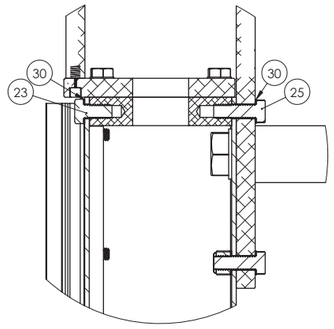
DETAIL D
SCALE 1 : 2



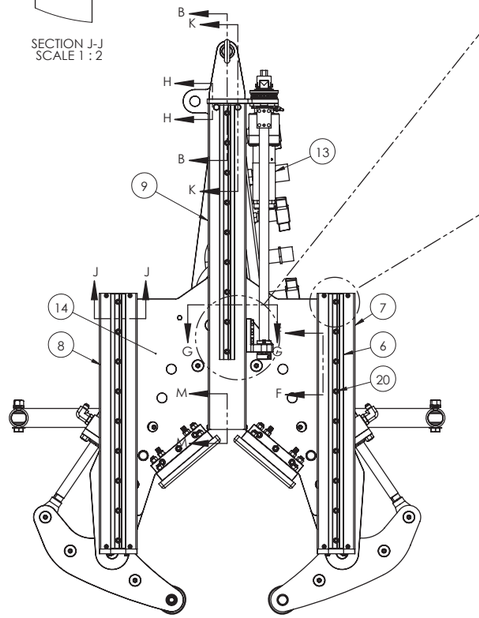
DETAIL C
SCALE 1 : 2

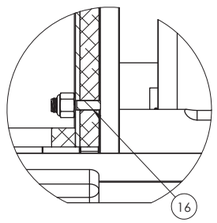


SECTION H-H
SCALE 1 : 2

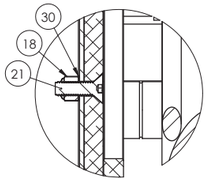


SECTION K-K
SCALE 1 : 2

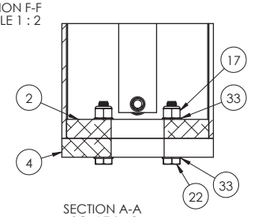




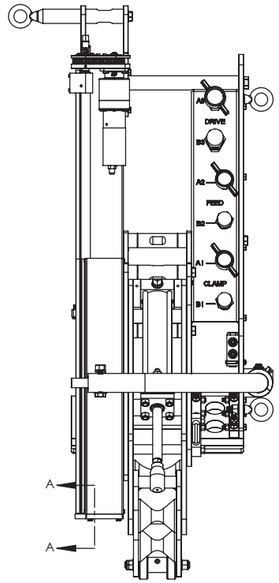
SECTION M-M
SCALE 1 : 2

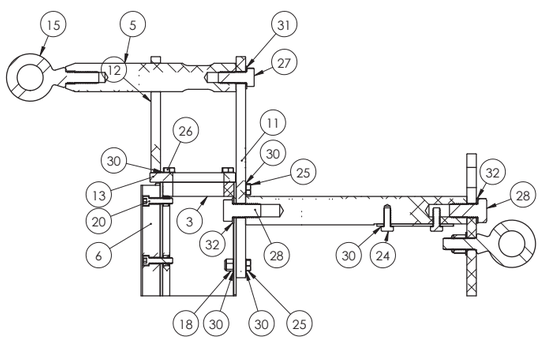


SECTION F-F
SCALE 1 : 2

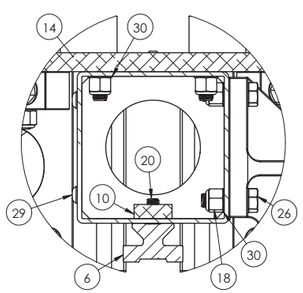


SECTION A-A
SCALE 1 : 2





SECTION B-B
SCALE 1 : 4



SECTION G-G
SCALE 1 : 2

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-027	PLATE, 027	3
2	10-010-00-027B	PLATE, 027B	2
3	10-010-00-028	PLATE, 028	1
4	10-010-00-029	PLATE, 029	2
5	10-010-00-251	ROD, 251	1
6	10-010-16-001	LINEAR GUIDE RAIL	3
7	10-010-16-020	TUBE, LINEAR GUIDE MOUNTING	1
8	10-010-16-020B	TUBE, LINEAR GUIDE MOUNTING	1
9	10-010-16-021	TUBE, LINEAR GUIDE MOUNTING	1
10	10-010-16-023	TAPPED RAIL	3
11	10-010-16-246-R1	PLATE, 246	1
12	10-010-16-246B-R1	PLATE, 246B	1
13	10-010-16-411-R1	FRAME FEED	1
14	10-010-16-420-R1	CLAMP, 16" - 4" PIPE RANGE	1
15	3014T867	EYEBOLT	1
16	90145A539	1/4 x 5/8 LG. DOWEL PIN	2
17	91831A029	LOCKNUT 1/4"-20, SS	8
18	91831A127	LOCKNUT 3/8"-16, SS	34
19	92196A539	SHCS 1/4"-20 x 5/8" LG, SS	4
20	92196A585	SHCS 5/16"-18x1.25"LG, SS	27
21	92210A626	FSHCS 3/8"-16x1.25"LG,SS	26
22	92240A546	HHCS 1/4"-20x1.5"LG, SS	8
23	92240A622	HHSC 3/8"-16 x 3/4" LG, SS	2
24	92240A624	HHCS, 3/8"-16 X 1" LNG., SS	2
25	92240A625	HHCS 3/8"-16x 1-1/8"LG, SS	4
26	92240A626	HHCS 3/8"-16x1.5"LG, SS	10
27	92240A798	HHCS 5/8"-11 x 1.5"LG, SS	1
28	92240A839	HHCS 3/4"-10 x 1.5"LG, SS	2
29	92949A537	BSHCS 1/4"-20x1/2"LG, SS	20
30	98017A199	3/8" WASHER, SS	52
31	98017A215	5/8 WASHER, SS	1
32	98017A220	3/4" WASHER, SS	2
33	98017A655	1/4" WASHER, SS	16
34	98017A689	5/16" WASHER, SS	27
35	91831A030	LOCKNUT 5/16"-18, SS	27

REV.	DESCRIPTION	DATE	APR.
2	UPGRADE TO R1	5/1/2014	Karl K.
1	PRODUCTION RELEASE	8/30/2010	AG

REVISION HISTORY

E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: DWS 416 CLAMP ASSEMBLY

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TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±1.5 MIN.

DRAWN BY: J. WILLIAMS — DATE: 8/11/10
APPROVED BY: KRP — DATE: 8/11/10
SCALE: 1:8
SHEET: 1 OF 1

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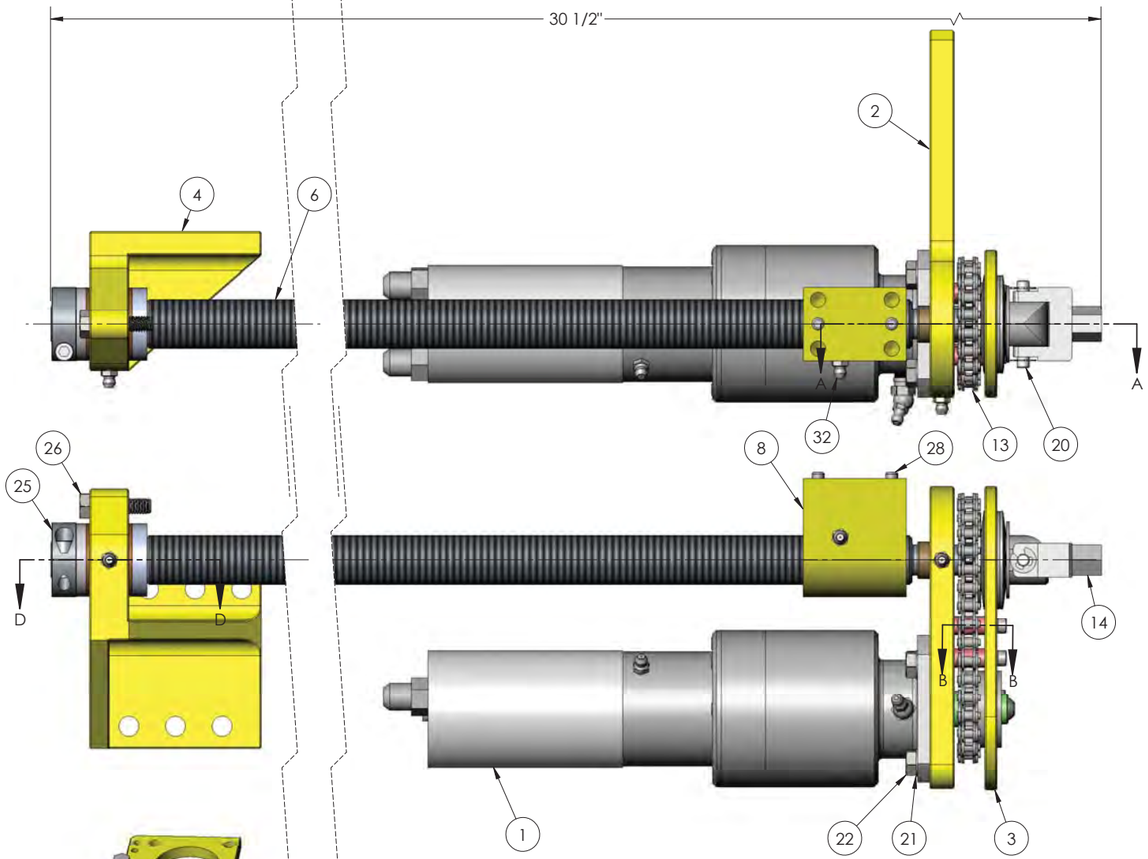
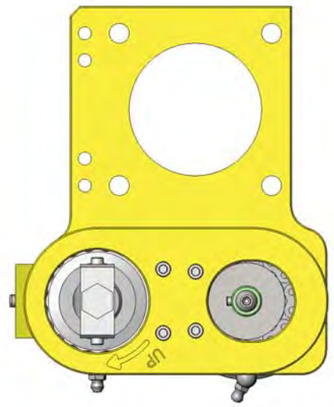
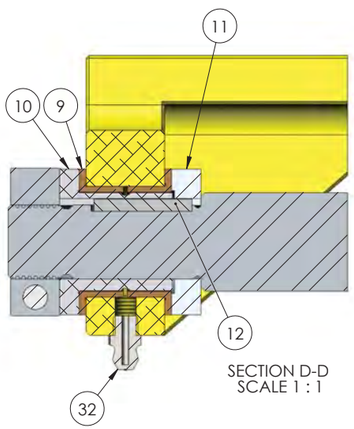
SIZE: D — DWG. NO: 10-010-16-410-R1 — REV: 2

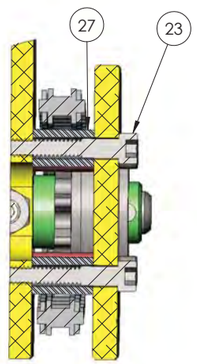




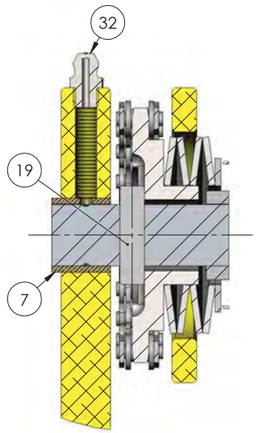
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-412-R1	PLANETARY GEAR MOTOR	1
2	10-010-00-041-R1	PLATE, 041-R1	1
3	10-010-00-042-R1	PLATE, 042-R1	1
4	10-010-00-045-R1	BLOCK, FEED SCREW MOUNTING	1
5	10-010-00-019	KEY	1
6	10-010-16-040	SCREW, FEED	1
7	10-010-00-043	BUSHING, FEED	1
8	10-010-00-044	NUT, FEED	1
9	10-010-00-046	BUSHING, FEED	2
10	10-010-00-047	RETAINER, FEED SCREW	1
11	10-010-00-048	WASHER, 048	1
12	10-010-00-049	KEY	1
13	10-010-00-CHAIN	ROLLER CHAIN #35-SS	1
14	P06-052-160	YOKE	1
15	P06-052-161	BUSHING, FEED CLUTCH	1
16	P06-052-181	SPROCKET FOR #35 CHAIN, 20T,3/8 PITCH	1
17	P06-052-182	SPROCKET FOR #35 CHAIN, 15T, 3/8 PITCH	1
18	19-019-00	WASHER, HARDENED THRUST	1
19	90-056-10	PIN, 1/4 X 1.00 DOWEL	1
20	9389A580	CLEVIS PIN	1
21	98017A689	5/16" WASHER, SS	4
22	92240A581	HHCS 5/16"-18 x 3/4" LG	4
23	92185A249	SHCS #10-24 x 1.25" LG	4
24	9713K94	DISC, CLUTCH	4
25	6438K56	CLAMP-ON SHAFT COLLAR	1
26	92240A585	HHCS 5/16"-18 x 1.25" LG	1
27	92320A231	STANDOFF	4
28	90145A539	1/4 x 5/8 LG. DOWEL PIN	2
29	92311A534	CUP PNT SET SCREW 1/4"-20 x 5/16" LG	2
30	91847A029	JAM NUT 1/4"-20, SS	1
31	92311A541	SET SCREW 1/4"-20 x 7/8" LG, SS	1
32	1293K21	1/4-28 GREASE FITTING; SS	3



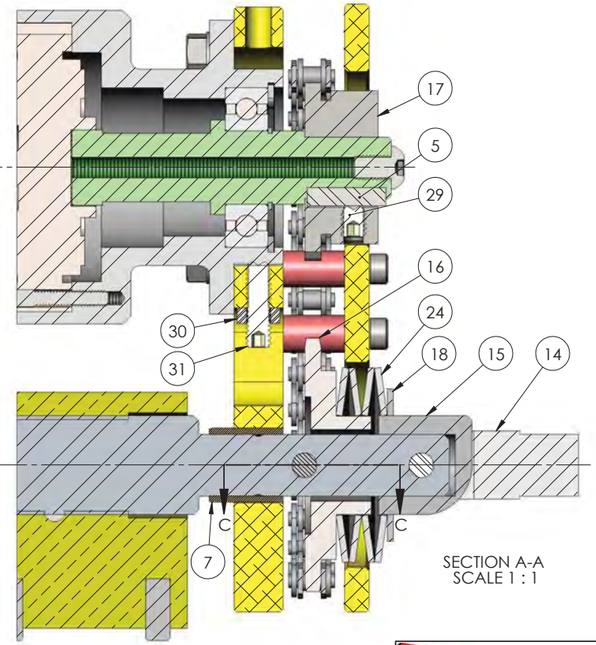
SECTION D-D
SCALE 1 : 1



SECTION B-B
SCALE 1 : 1



SECTION C-C
SCALE 1 : 1



SECTION A-A
SCALE 1 : 1

REV.	DESCRIPTION	DATE	APR.
2	UPGRADE TO R1	5/1/2014	Karl K
1	PRODUCTION RELEASE	12/29/2009	KRP

REVISION HISTORY

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TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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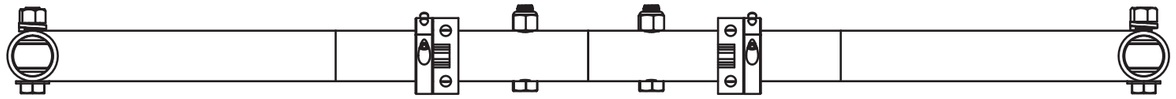
E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

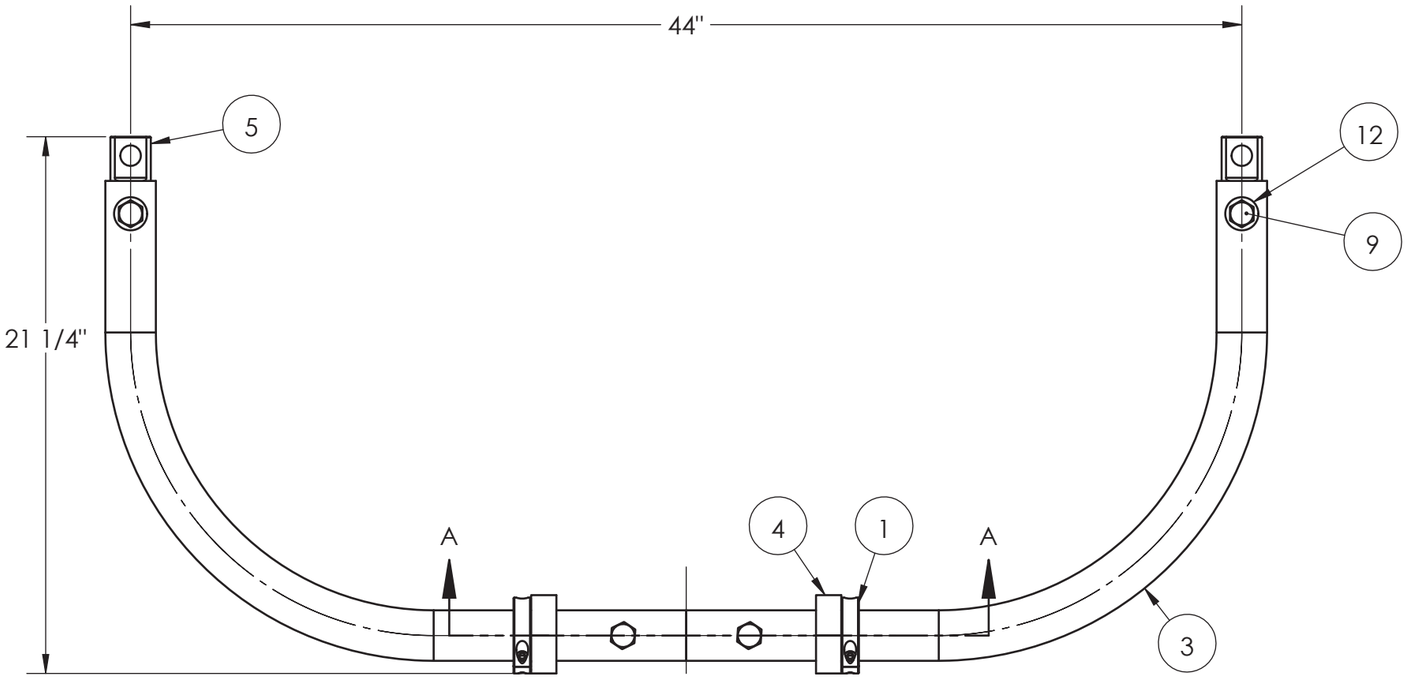
TITLE: FRAME FEED

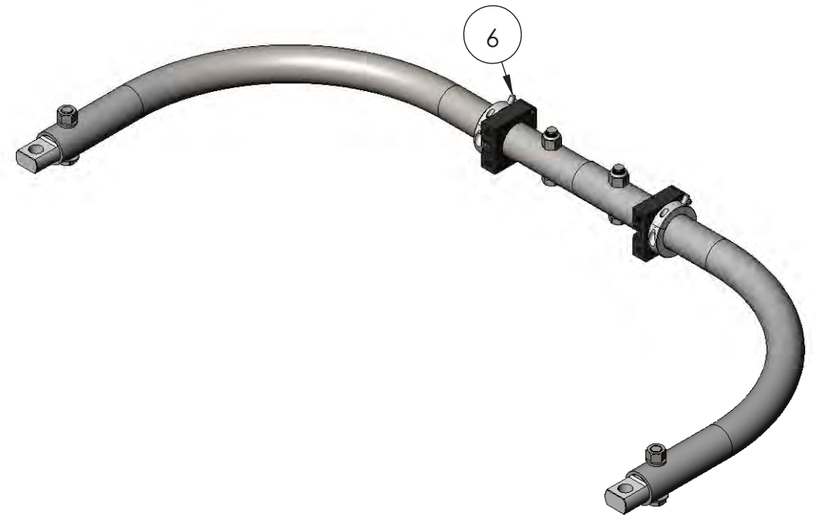
DRAWN BY	APPROVED BY	SCALE
AG	.	1:2
DATE 10/26/09	DATE .	SHEET 1 OF 1

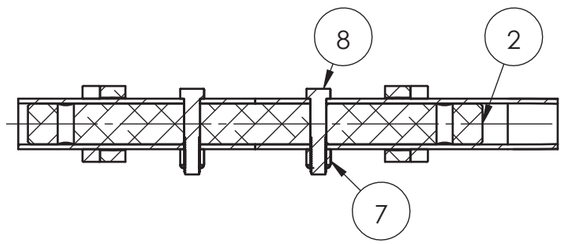
SIZE	DWG. NO.	REV.
C	10-010-16-411-R1	2

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-254	COLLAR	2
2	10-010-16-255	BAR, LIFTING	1
3	10-010-16-250	TUBE, LIFTING	2
4	10-010-16-253	PLATE 253	2
5	10-010-00-252-R1	LIFTING PLUG	2
6	90145A583	DOWEL PIN 5/16 x 1" LG, SS	4
7	91831A144	LOCKNUT 5/8"-11,SS	2
8	92198A806	HHCS 5/8"-11x3" LG, SS	2
9	91286A410	Gr 8 Coated Alloy HHCS 5/8"-11	2
10	92147A035	Type 316 SS Split Lock Washer 5/8"	2
11	93827A253	Ult-Coat Gr 8l Hex Nut 5/8"-11	2
12	98180A160	Ult-Coat Gr 8 SAE Fl Wash 5/8"	2









SECTION A-A

REV.	DESCRIPTION	DATE	APR.
2	UPGRADE TO R1	4/30/2014	Karl K
1	PRODUCTION RELEASE	1/7/2010	AG

REVISION HISTORY

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FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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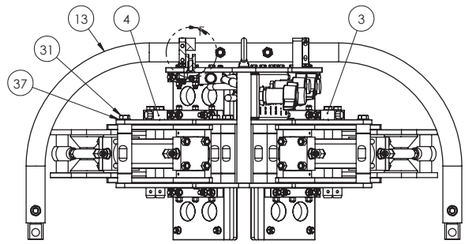
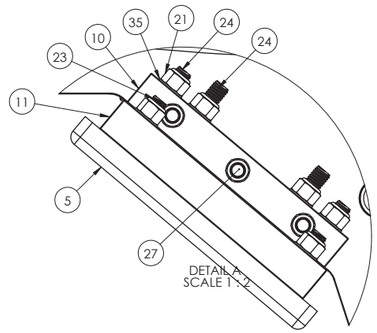
E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: LIFTING TUBE

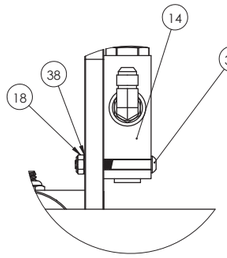
DRAWN BY	APPROVED BY	SCALE
AG	.	1:6
DATE	DATE	SHEET
1/7/2010	.	1 OF 1

SIZE	DWG. NO.	REV.
B	**10-010-16-413-R1**	2

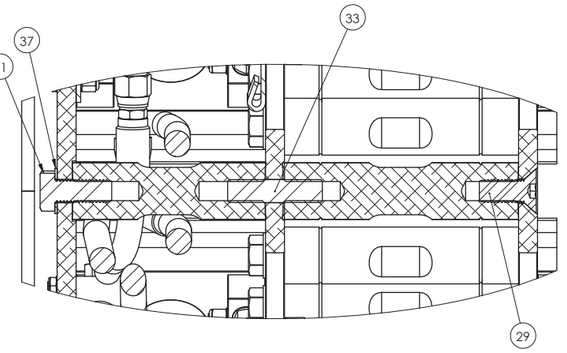




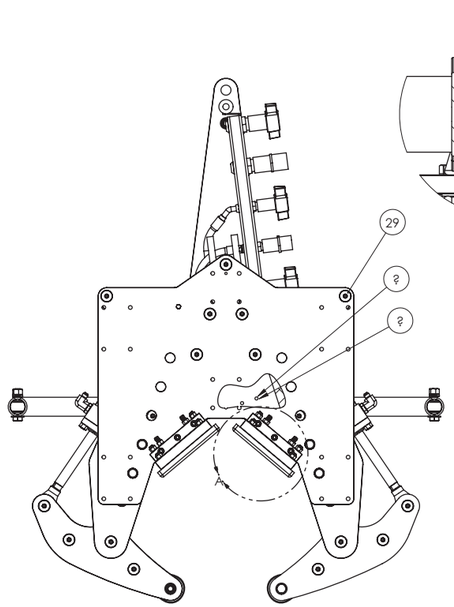
DETAIL A
SCALE 1 : 2

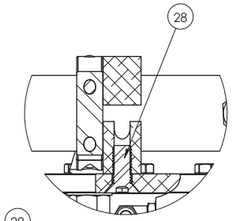


DETAIL C
SCALE 1 : 2

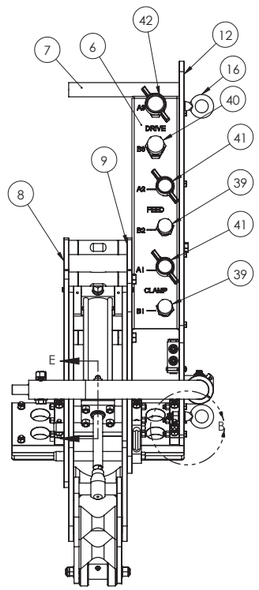


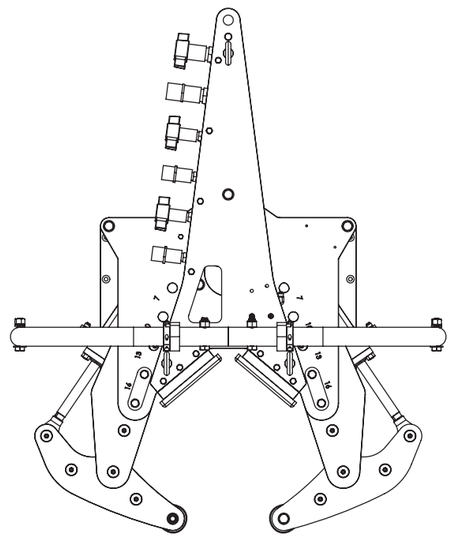
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-209-R1	ROD,209-R1	7
2	10-010-00-215	ROD, 215	1
3	10-010-16-110-LH	CLAMP PIN FORK - LH	1
4	10-010-16-110-RH	CLAMP PIN FORK - RH	1
5	10-010-16-221	SHOE, 221	4
6	10-010-16-224B	WELDMENT, BULKHEAD PLATE	1
7	10-010-16-242	ROD, 242	1
8	10-010-16-203A-R1	PLATE, 203A	1
9	10-010-16-203B-R1	PLATE, 230B	1
10	10-010-16-211-R1	BAR, 211	6
11	10-010-16-220-R1	PLATE, 220	2
12	10-010-16-222-R1	PLATE, 222	1
13	10-010-16-413-R1	LIFTING TUBE	1
14	10-010-00-419B	Flow Divider Combiner Valve Assembly	1
15	10-010-16-421-R1	ADJUSTABLE CLAMP WITH ACTUATOR	2
16	3014T867	EYEBOLT	3
17	3609K2	ZINC ANODE	1
18	90101A230	NUT, NYLOCK JAM 1/4-20	2
19	90715A185	LOCKNUT 5/8"-11,SS	3
20	91831A127	LOCKNUT 3/8"-16, SS	22
21	91831A133	HEX LOCKNUT 7/16"-14, SS	28
22	91831A137	LOCKNUT 1/2"-13, SS	1
23	92186A677	HHCS, 7/16-14 X 2" (316 SS)	4
24	92186A681	HHCS, 7/16-14 X 3" (316 SS)	24
25	92198A633	HHCS 3/8"-16 x 2.25" LG, SS	6
26	92198A752	HHCS, 1/2"-13 X 3-1/4" LNG., SS	1
27	92210A632	FHCS 3/8"-16 x 2" LG	12
28	92210A714	FHCS, 1/2"-13 X 1-1/4" LNG., SS	4
29	92210A798	FHCS, 5/8"-11 X 1-1/2" LNG., SS	7
30	92240A625	HHCS 3/8"-16x 1-1/8"LG, SS	4
31	92240A798	HHCS 5/8"-11 x 1.5"LG, SS	7
32	92949A550	BHCS, 1/4-20 x 2" LNG.	2
33	95412A804	5/8-11 x 1.5" LG. STUD	1
34	98017A199	3/8" WASHER, SS	32
35	98017A204	7/16 WASHER,SS	56
36	98017A209	1/2 WASHER, SS	2
37	98017A215	5/8 WASHER, SS	10
38	98017A655	1/4" WASHER, SS	2
39	PARKER 6105-08	QUICK CONNECT, 1/2" MALE	2
40	PARKER 6105-16	QUICK CONNECT, 1" MALE	1
41	PARKER 6125-08	QUICK CONNECT, 1/2" FEMALE	2
42	PARKER 6125-16	QUICK CONNECT, 1" FEMALE	1
43	Parker #13943-8-6	90 DEG HOSE END -8 TO -6	2
44	SHF43-06-08-FJ45	45 DEG HOSE END -6 TO -8	2
45	Parker 10643-8-6-SS	STRAIGHT HOSE END -8 TO -6	2
46	Parker #10643-16-16	STRAIGHT HOSE END -16	2



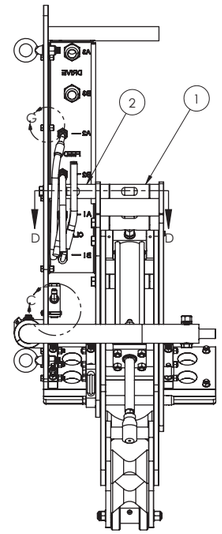


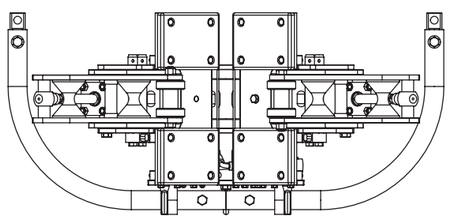
DETAIL F
SCALE 1 : 2

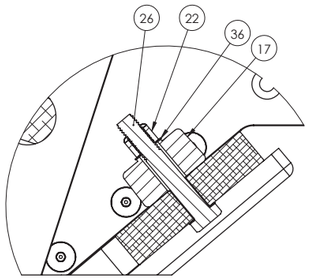




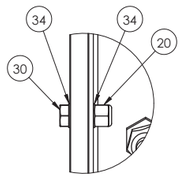
SECTION D-D
SCALE 1 : 2



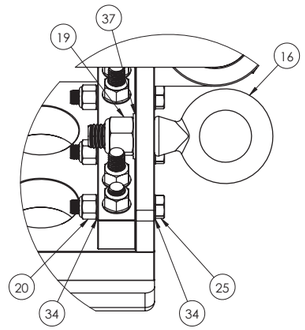




SECTION E-E
SCALE 1 : 2



DETAIL G
SCALE 1 : 2



DETAIL B
SCALE 1 : 2

REV.	DESCRIPTION	DATE	APR.
2	UPGRADE TO R1	5/1/2014	Karl K
1	RELEASED FOR PRODUCTION	8/18/2010	JPW

REVISION HISTORY

UNLESS OTHERWISE SPECIFIED:
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DO NOT SCALE DRAWING.

TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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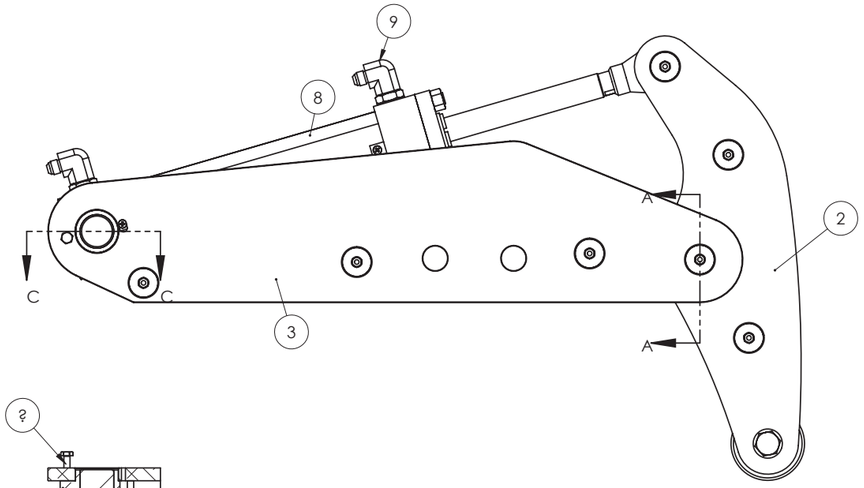
E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

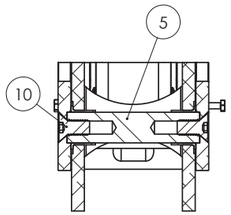
TITLE: CLAMP, 16" - 4" PIPE RANGE

DRAWN BY	APPROVED BY	SCALE
J. WILLIAMS	KRP	1:8
DATE: 08/17/10	DATE: 08/17/10	SHEET: 1 OF 1

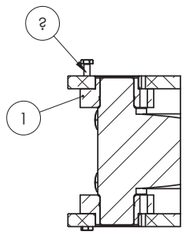
SIZE	DWG. NO.	REV.
D	10-010-16-420-R1	2

ITEM NO.	PART NUMBER	DESCRIPTION	Default/ QTY.
1	10-010-00-205-R1	BUSHING, CYLINDER	2
2	10-010-16-422-R1	CLAMP ARM ASSEMBLY	1
3	10-010-16-202-R1	PLATE, 202	1
4	10-010-16-202B-R1	PLATE, 202B	1
5	10-010-00-207	ROD,207	1
6	10-010-00-213	SPACER, 213	1
7	10-010-00-215	ROD, 215	2
8	10-010-16-248	HYDRAULIC CYLINDER	1
9	Parker 6-10_c5OX-S	ORB-JIC ELBOW	2
10	92210A796	FHCS 5/8"-11x 1.25" LG.	8
11	92198A544	HHCS 1/4"-20 x 1.25" LG	2

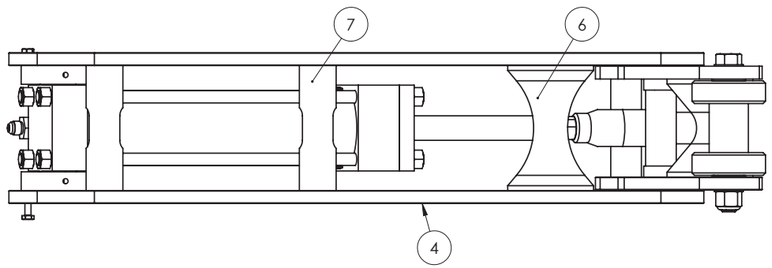


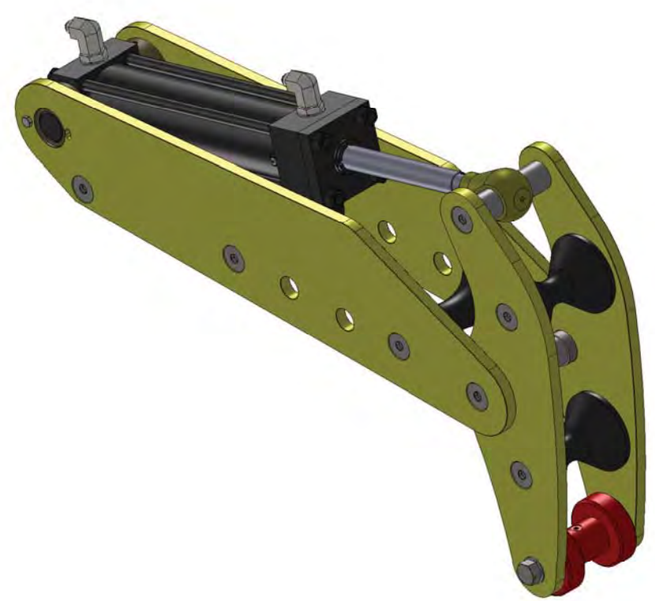


SECTION A-A



SECTION C-C





REV.	DESCRIPTION	DATE	APR.
2	UPGRADE TO R1	4/30/2014	Karl K
1	RELEASED FOR PRODUCTION	8/18/2010	JPW

REVISION HISTORY

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DO NOT SCALE DRAWING.

TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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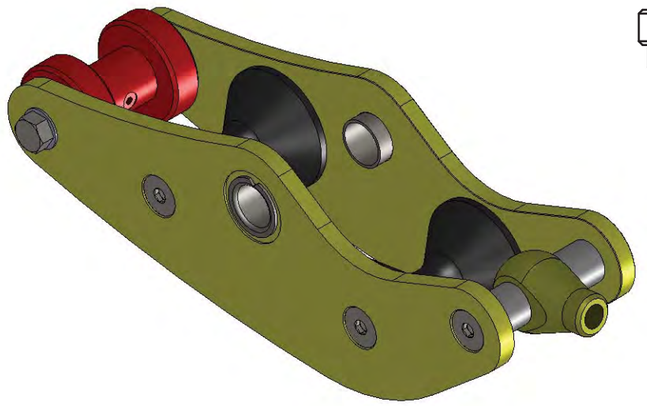
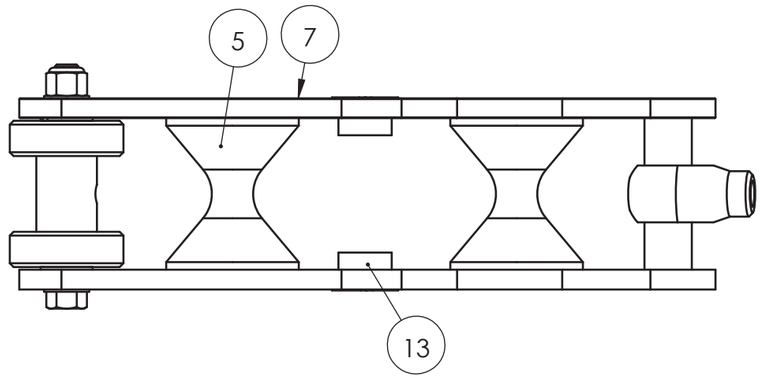
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: ADJUSTABLE CLAMP WITH ACTUATOR

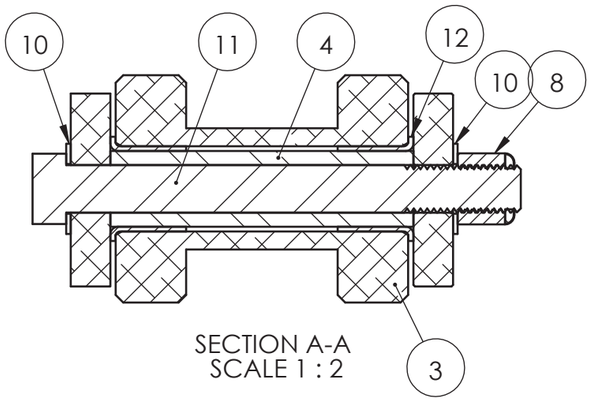
DRAWN BY	APPROVED BY	SCALE
J. WILLIAMS	KRP	1:4
DATE	DATE	SHEET
08/18/10	08/18/10	1 OF 1

SIZE	DWG. NO.	REV.
C	**10-010-16-421-R1**	2

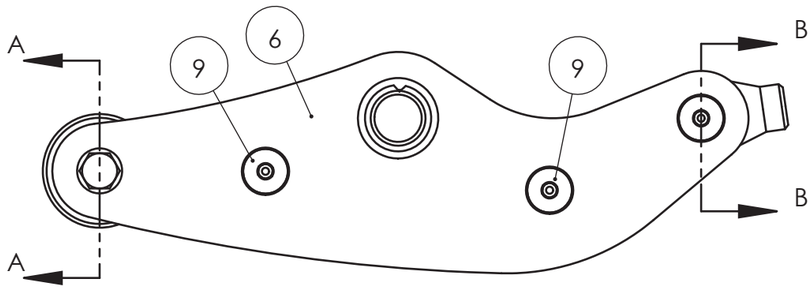


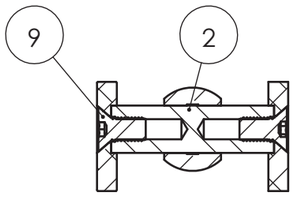


ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-204	ROD END, CYLINDER	1
2	10-010-00-206	ROD, 206	1
3	10-010-00-208	ROLLER	1
4	10-010-00-210	TUBE, 210	1
5	10-010-00-212	SPACER, 212	2
6	10-010-16-201-R1	PLATE, 201	1
7	10-010-16-201B-R1	PLATE, 201B	1
8	90715A185	LOCKNUT 5/8"-11,SS	1
9	92210A796	FHCS 5/8"-11x 1.25" LG.	6
10	98017A215	5/8 WASHER, SS	2
11	92198A818	HHCS 5/8-11 x 6" LG, SS	1
12	Garlock 16FDU16	BUSHING	2
13	Garlock 20FDU16	BUSHING	2



SECTION A-A
SCALE 1 : 2





SECTION B-B

REV.	DESCRIPTION	DATE	APR.
2	UPGRADE TO R1	4/29/2014	Karl K
1	RELEASED FOR PRODUCTION	8/18/2010	JPW

REVISION HISTORY

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DO NOT SCALE DRAWING.

TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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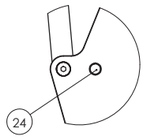
E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

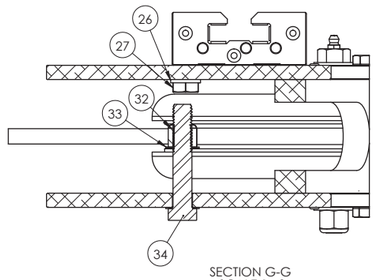
TITLE: CLAMP ARM ASSEMBLY

DRAWN BY	APPROVED BY	SCALE
J. WILLIAMS	KRP	1:4
DATE: 08/18/10	DATE: 08/18/10	SHEET: 1 OF 1

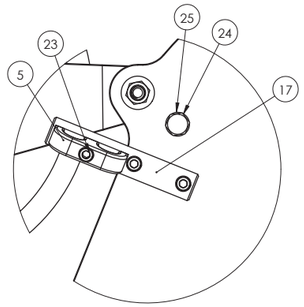
SIZE	DWG. NO.	REV.
B	**10-010-16-422-R1**	2



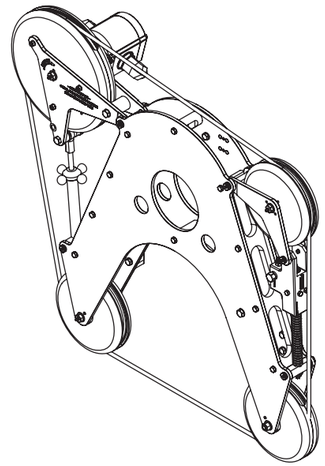
DETAIL F
SCALE 1 : 4



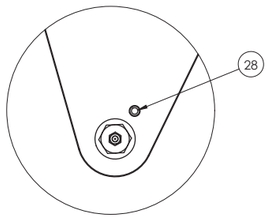
SECTION G-G
SCALE 1 : 2

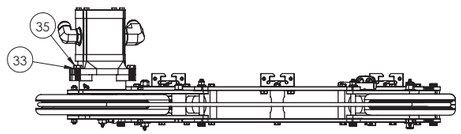


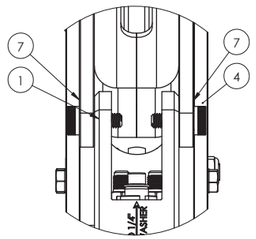
DETAIL D
SCALE 1 : 2



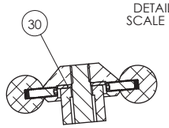
ITEM NO.	PART NUMBER	DESCRIPTION	Default/ QTY.
1	H10-071-200	DWS FEED CONTROL UNIT	1
2	10-010-00-001	HYDRAULIC MOTOR	1
3	10-010-16-030A-R1	PLATE, 030A-R1	1
4	10-010-16-030B-R1	PLATE, 030B-R1	1
5	10-010-00-279-R1	BLOCK, 279	1
6	10-010-00-431C-R1	FRAME DRIVE ARM	1
7	10-010-00-433B-R1	ASSY, TENSIONING WHEEL	1
8	10-010-00-434B-R1	ASSY, TENSIONING WHEEL	2
9	10-010-00-003	LINEAR BEARING	3
10	10-010-00-010	TENSION KNOB	1
11	10-010-00-023	ROD, 023	1
12	10-010-00-024	SPACER, 024	2
13	10-010-00-260	ROD, 260	1
14	10-010-00-261	ROD, 261	1
15	10-010-16-038	SPACER, -038	2
16	10-010-16-070	DESCRIPTION	1
17	10-010-16-279	BAR, 279	1
18	10-010-36-038	ROD, 215	2
19	10-010-00-062	BALL JOINT ROD END	1
20	91831A029	LOCKNUT 1/4"-20, SS	2
21	90313A203	WASHER, 1/2" FENDER, SS	2
22	92196A542	SHCS 1/4"-20 x 1" LG, SS	2
23	92196A541	SHCS 1/4"-20 x 7/8" LG, SS	1
24	92240A625	HHCS 3/8"-16x 1-1/8"LG, SS	20
25	98017A199	3/8" WASHER, SS	20
26	93475A280	WASHER 10mm, SS	12
27	91287A375	HHCS M10 x 1.5, 45mm LG, SS	12
28	90145A539	1/4 x 5/8 LG. DOWEL PIN	4
29	90298A712	SHOULDER SCREW 3/8"-16 x 1" LG, SS	2
30	1860A032	WASHER 1/2", PH 17-4	1
31	92198A753	HHCS 1/2"-13x3.75" LG, SS	1
32	91831A137	LOCKNUT 1/2"-13, SS	2
33	98017A209	1/2 WASHER, SS	6
34	92198A723	HHCS, 1/2"-13 X 2-3/4" LNG., SS	1
35	92240A714	HHCS 1/2"-13 x 1.25" LG	2
36	Parker 16_C5OX-SS	ORB TO JIC ELBOW	1
37	Parker 16-20_c5ox-s	ORB TO JIC ELBOW	1
38	Garlock 08FDU06	BUSHING	4



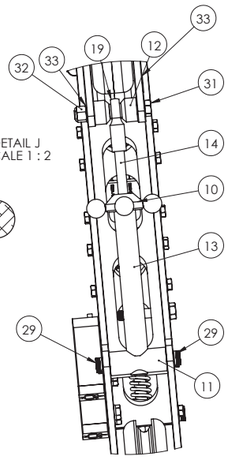




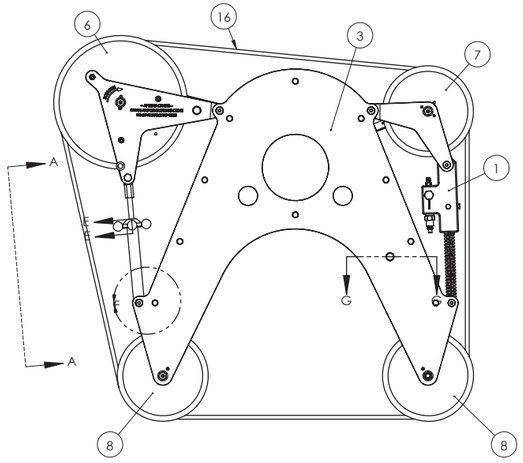
DETAIL B
SCALE 1 : 2



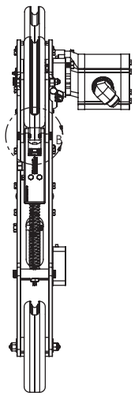
SECTION E-E
SCALE 1 : 2

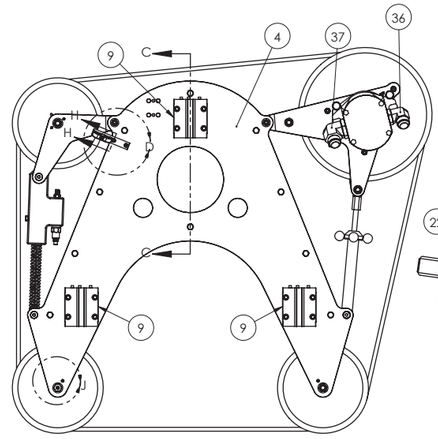


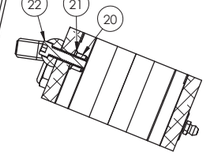
DETAIL J
SCALE 1 : 2



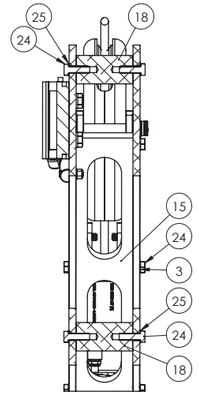
VIEW A-A
SCALE 1 : 4







SECTION H-H
SCALE 1 : 2



SECTION C-C
SCALE 1 : 4

REV.	DESCRIPTION	DATE	APR.
2	UPGRADE TO R1	5/1/2014	Karl K
1	PRODUCTION RELEASE	8/17/2010	JPW

REVISION HISTORY

E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: DWS 416 BOW ASSEMBLY

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DO NOT SCALE DRAWING.

TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

DRAWN BY	APPROVED BY	SCALE
J. WILLIAMS	KRP	1:8
DATE 08/17/10	DATE 08/17/10	SHEET 1 OF 1

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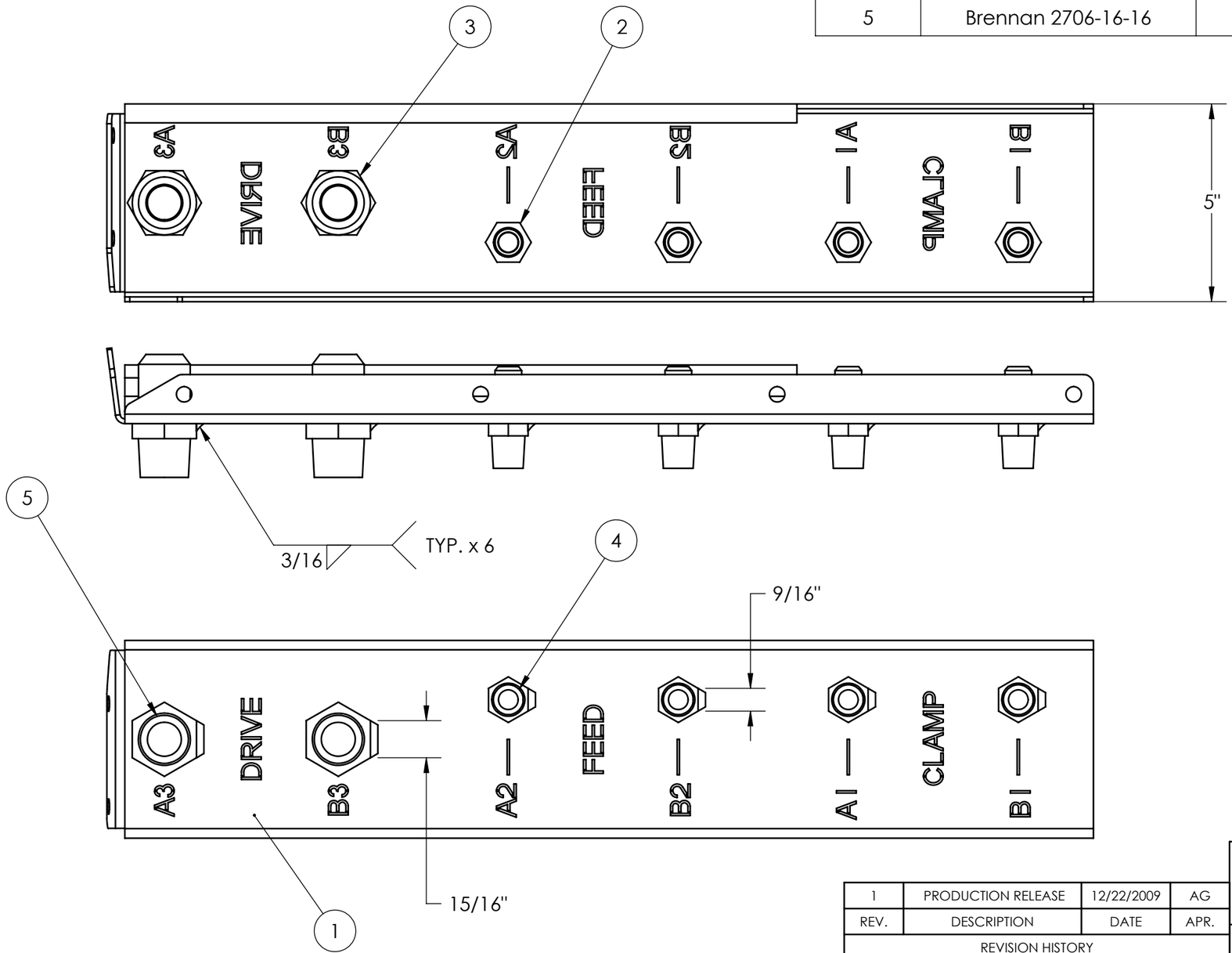
SIZE D | DWG. NO. 10-010-16-430-R1 | REV. 2

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-16-224	PLATE, BULKHEAD	1
2	Brennan 0306-08	NUT, BULKHEAD	4
3	Brennan 0306-16	NUT, BULKHEAD	2
4	Brennan 2706-08-08	MP-MJ BULKHEAD STRAIGHT	4
5	Brennan 2706-16-16	MP-MJ BULKHEAD STRAIGHT	2



REV.	DESCRIPTION	DATE	APR.
1	PRODUCTION RELEASE	12/22/2009	AG

REVISION HISTORY

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE IN INCHES.
E.H. WACHS WORKMANSHIP STANDARDS (WI 17-01)
SHALL APPLY TO ALL ITEMS NOT SPECIFIED ON DRAWING.
DO NOT SCALE DRAWING.

TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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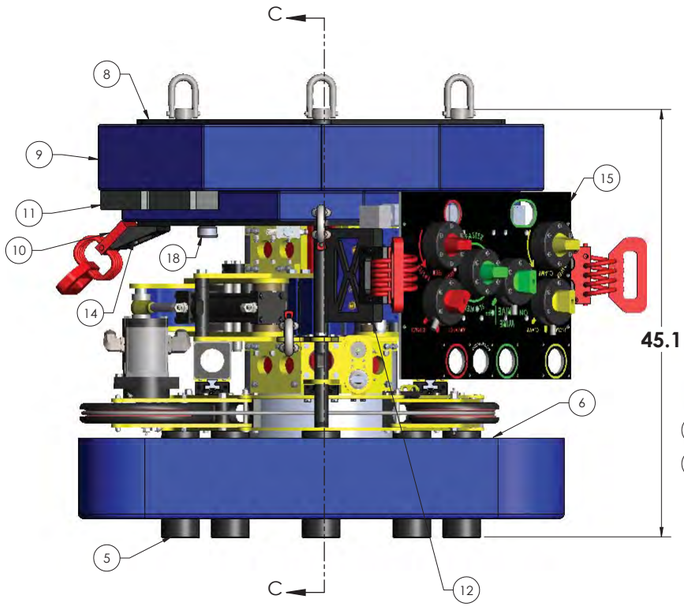
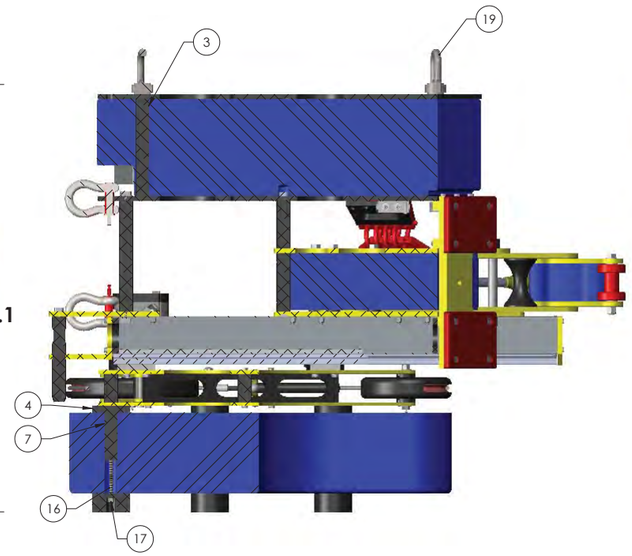
E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: WELDMENT, BULKHEAD PLATE

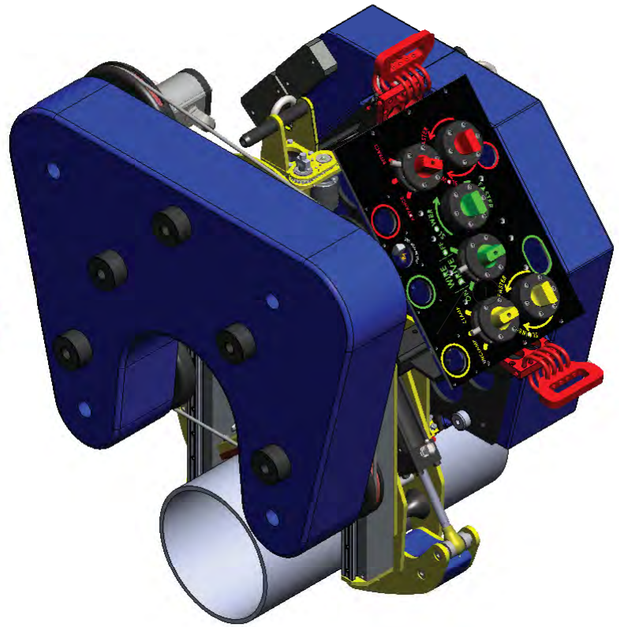
DRAWN BY	APPROVED BY	SCALE
J. WILLIAMS	KRP	1:3
DATE	DATE	SHEET
08/13/09	08/13/09	1 OF 2

SIZE	DWG. NO.	REV.
B	**10-010-16-224B**	1

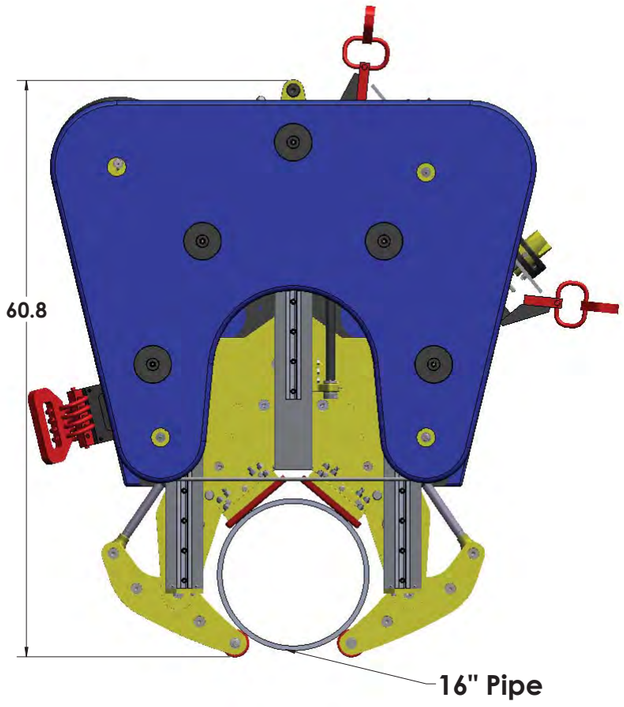




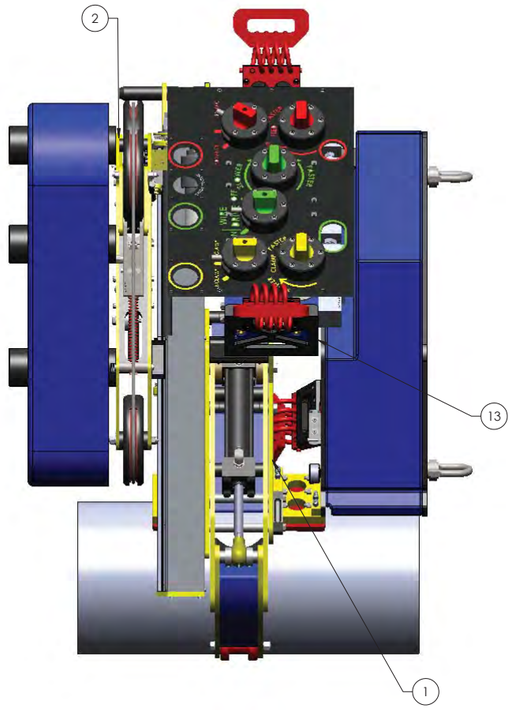
SECTION C-C

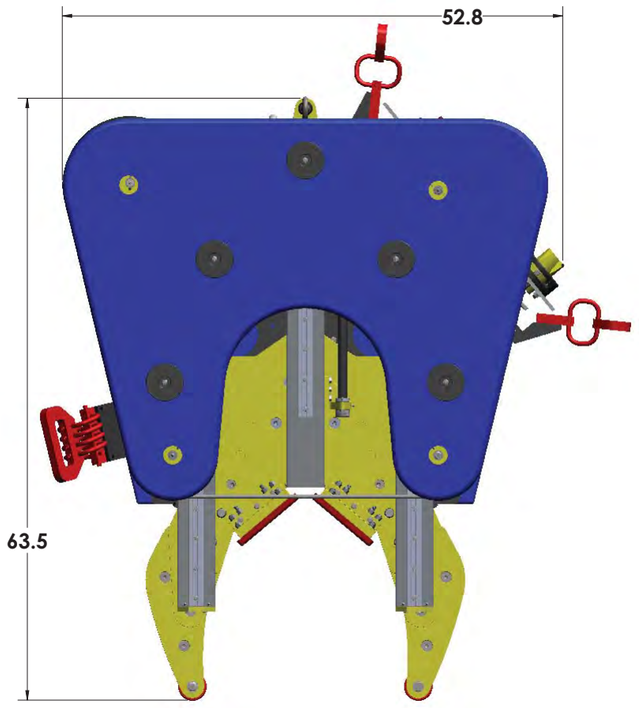


ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	10-010-16-410-ROV	DWDWS 416 CLAMP ASSEMBLY	1
2	10-010-16-430-ROV	DWDWS 416 BOW ASSEMBLY	1
3	10-010-16-223	ROD, 223	5
4	10-010-00-301	SPACER, TOP SLAB	5
5	10-010-00-302	WASHER, C-BORED	5
6	10-010-16-303	FLOTATION	1
7	10-010-00-304	STANDOFF, TOP SLAB	5
8	10-010-16-305	PLATE, 305 ROV	1
9	10-010-16-306	REAR FLOTATION BLOCK	1
10	10-010-00-312	ROV GRAB HANDLE, COMPLIANT	3
11	10-010-00-320	2 X4 X 8 LEAD WEIGHT	2
12	10-010-16-323	UPPER MANIFOLD/BULKHEAD WELDMENT	1
13	10-010-16-324	LOWER MANIFOLD/BULKHEAD BRACKET	1
14	10-010-00-326	ROV GRAB HANDLE BRACKET,45 DEG	3
15	H10-084-200-A	ROV INTERFACE PANEL	1
16	98804A496	3/8-16 X 8 LG FULLY THREADED ROD	5
17	91831A127	NUT, 3/8-16 SS NYLOCK	5
18	3609K2	ZINC ANODE	2
19	2949T37	2000lb HOIST RING 316 SS	3



Clamp arms closed





APPROX. DRY WEIGHT IN AIR - 1280 lbs.

APPROX. WEIGHT IN SEAWATER - 50-100 lbs.

REV.	DESCRIPTION	DATE	APR.
1	RELEASED FOR PRODUCTION	9/18/2014	Karl K

REVISION HISTORY

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE IN INCHES.
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DO NOT SCALE DRAWING.

TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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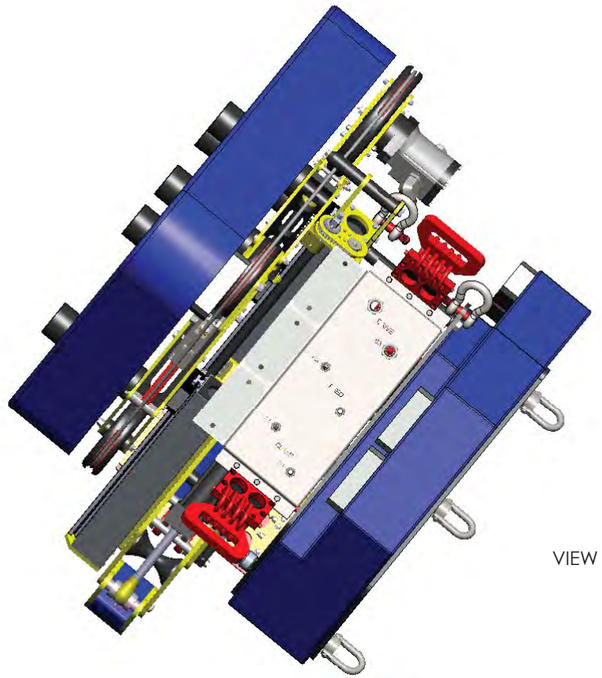
E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: 16" DWDWS, SHOWN IN 16" PIPE CONFIG

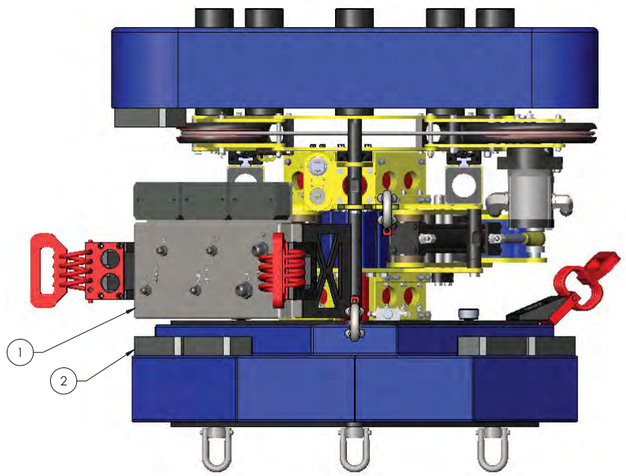
DRAWN BY	APPROVED BY	SCALE
Karl K	.	1:8
DATE: 5/27/2014	DATE	SHEET: 1 OF 4

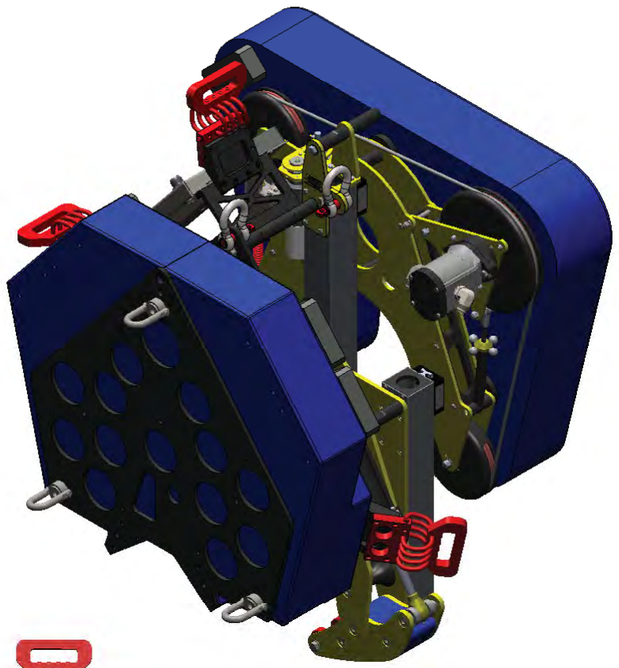
SIZE: D | DWG. NO.: 10-010-516-ROV | REV.: 1

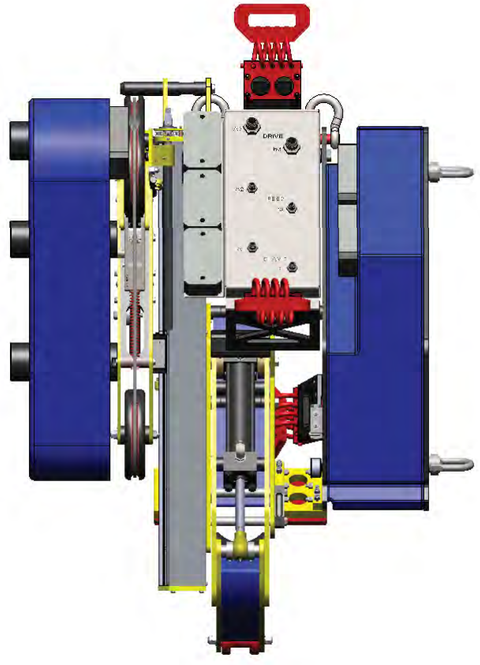
ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	10-010-16-322	DWDWS BULKHEAD ASSEMBLY	1
2	10-010-00-320	2 X4 X 8 LEAD WEIGHT	5

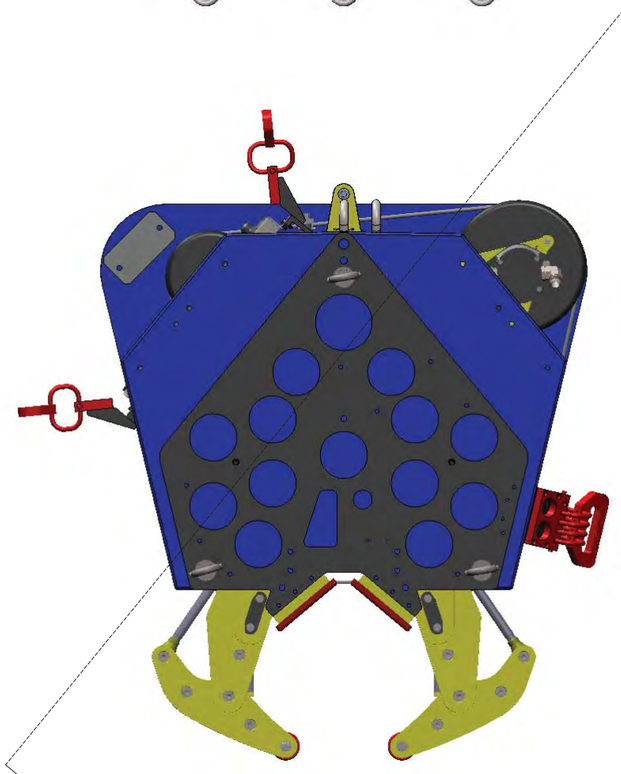


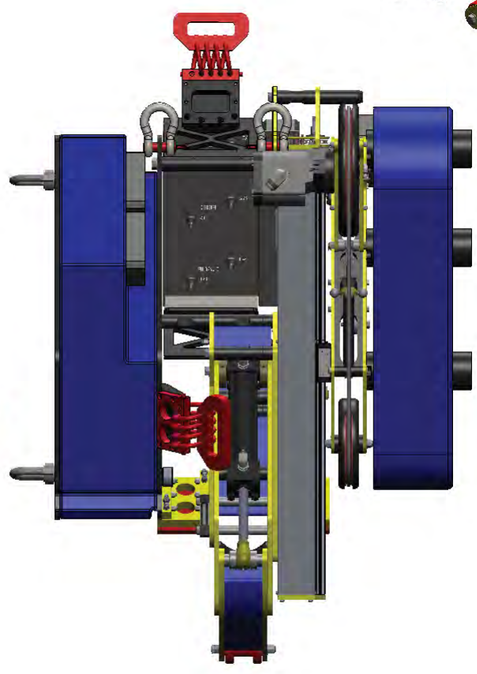
VIEW A-A

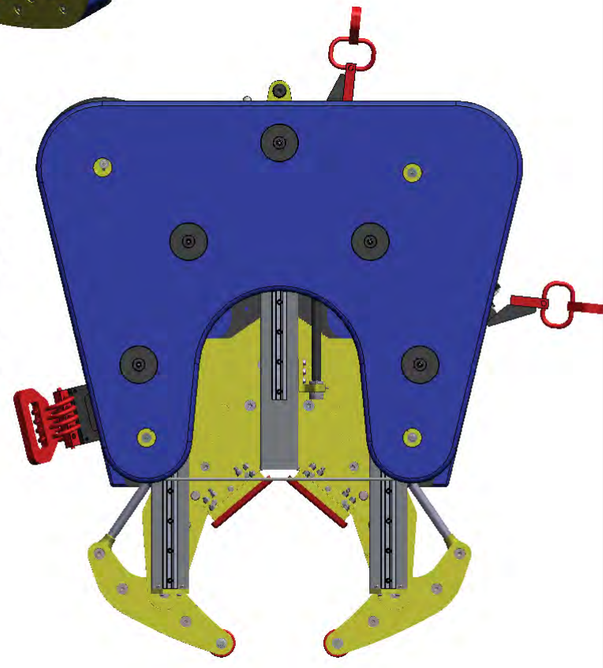












THIS PAGE SHOWN WITH BULKHEAD
FOR HOSE CONNECTION INSTALLED

E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: 16" DWDWS, 16" CONFIG, REMOTE CONTROL BULKHEAD

DRAWN BY	APPROVED BY	SCALE
Karl K	-	1:8
DATE: 5/27/2014	DATE:	SHEET: 2 OF 4

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TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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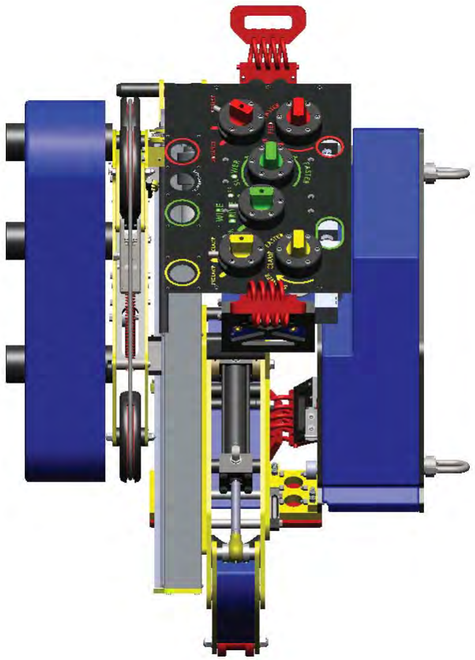
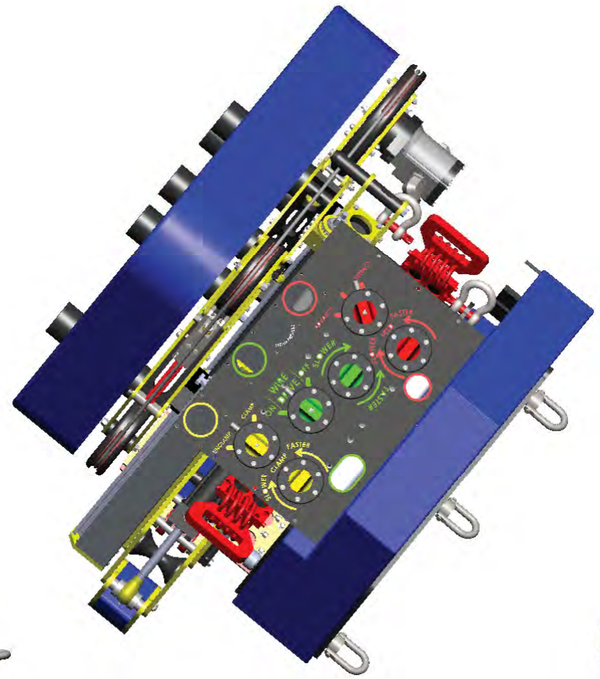
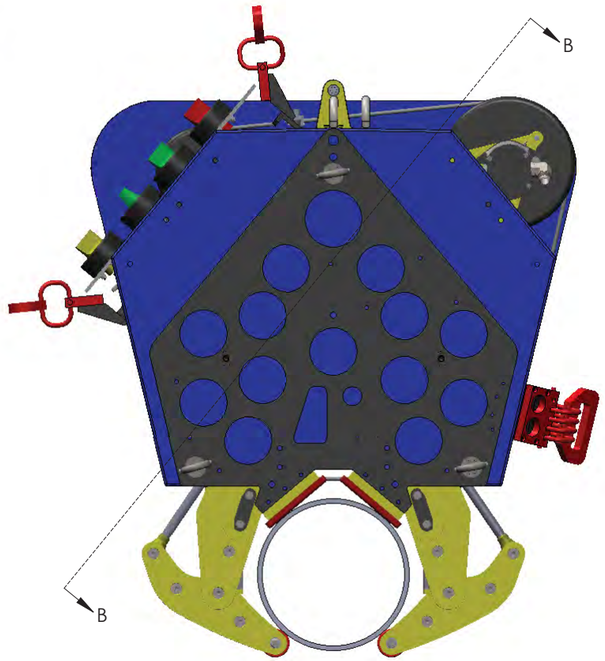
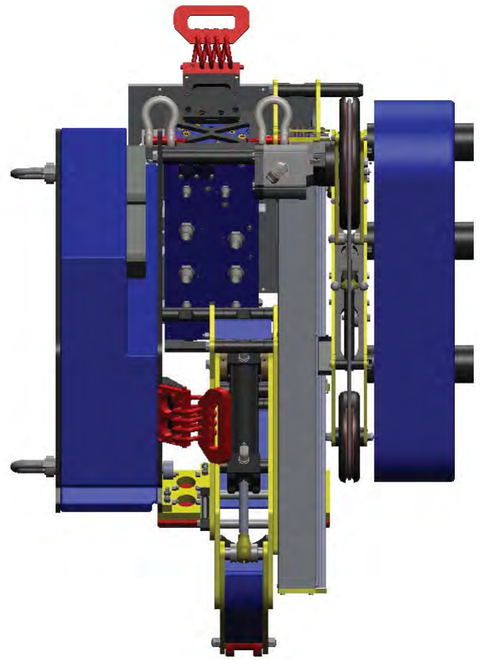
SIZE	DWG. NO.	REV.
D	10-010-516-ROV	1





VIEW B-B





THIS PAGE SHOWN WITH CONTROL PANEL INSTALLED

E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: 16" DWDWS, SHOWN IN 16" PIPE CONFIG

DRAWN BY	APPROVED BY	SCALE
Karl K	-	1:8
DATE: 5/27/2014	DATE:	SHEET: 3 OF 4

UNLESS OTHERWISE SPECIFIED:
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TWO PLACE DECIMAL ±.030
THREE PLACE DECIMAL ±.005
ANGULAR ±1/2 MIN.

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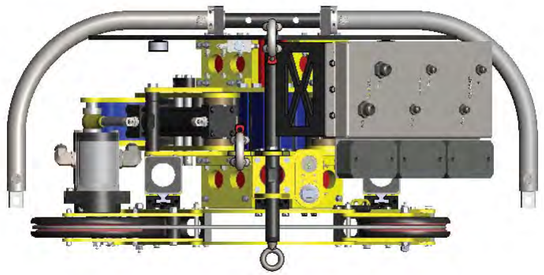
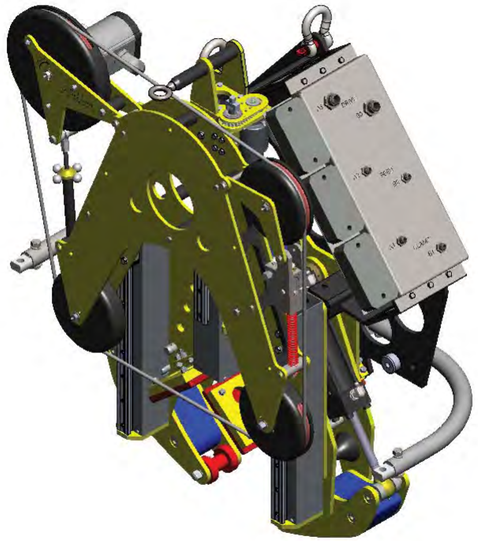
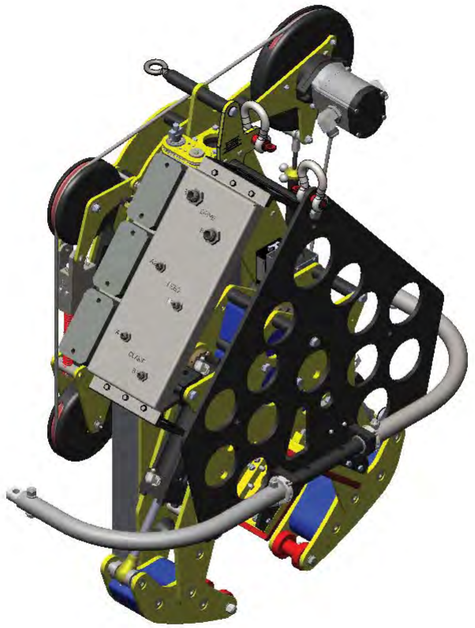
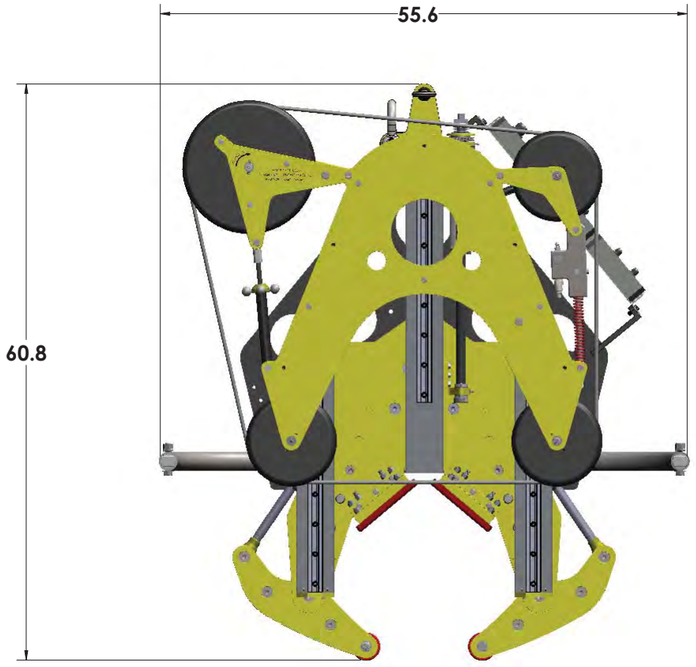
SIZE	DWG. NO.	REV.
D	10-010-516-ROV	1

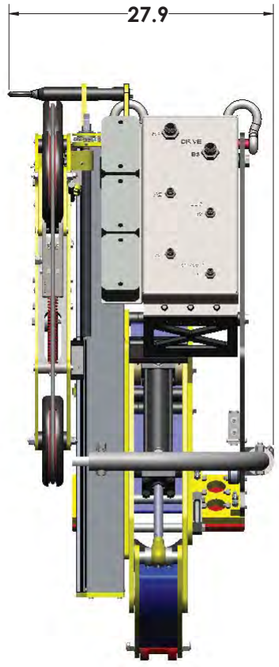
APPROXIMATLEY 700 LBS IN AIR
SHOWN WITH BULKHEAD PANEL INSTALLED AND FLOTATION REMOVED
STD LIFT ARM REINSTALLED FOR "FRONT TYPE" VERTICAL LIFT

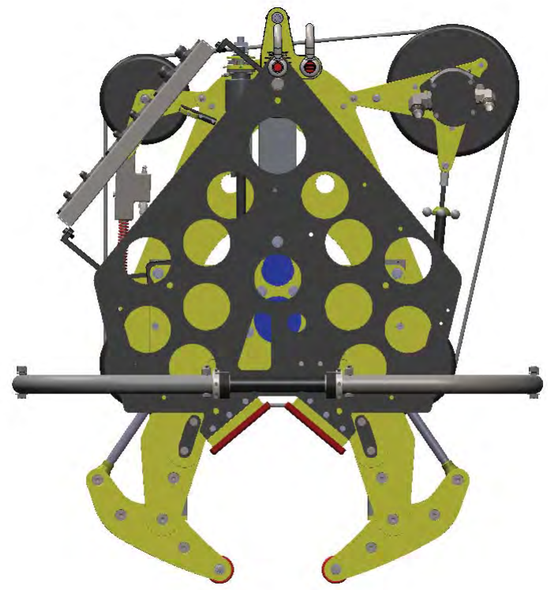












E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: 16" DWDWS 16" CONFIG, FLOTATION MINIMIZED

UNLESS OTHERWISE SPECIFIED:
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DO NOT SCALE DRAWING.

TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

DRAWN BY	APPROVED BY	SCALE
Karl K	.	1:8
DATE 5/27/2014	DATE	SHEET 4 OF 4

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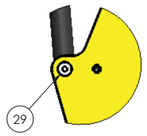
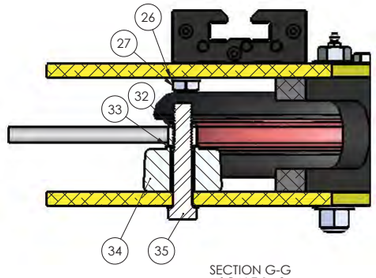
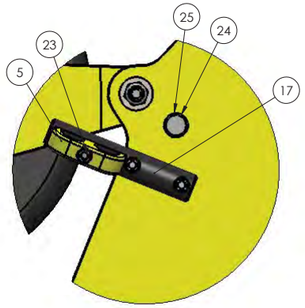
SIZE	DWG. NO.	REV.
D	10-010-516-ROV	1



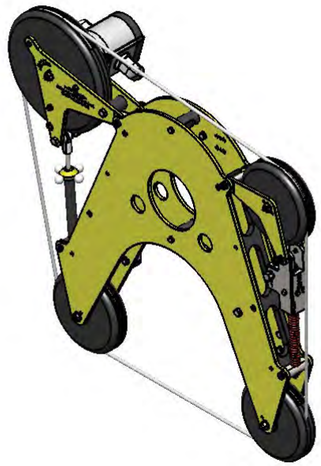
DETAIL F
SCALE 1 : 4



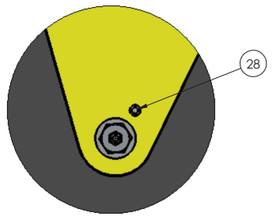
SECTION G-G
SCALE 1 : 2

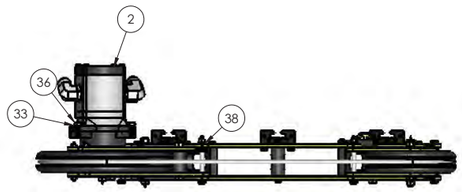


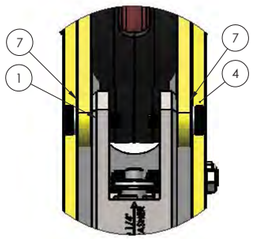
DETAIL D
SCALE 1 : 2



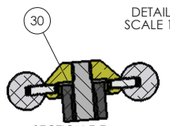
ITEM NO.	PART NUMBER	DESCRIPTION	Default/ QTY.
1	H10-071-200	DWS FEED CONTROL UNIT	1
2	10-010-00-001	HYDRAULIC MOTOR	1
3	10-010-16-030A-R1	PLATE, 030A-R1	1
4	10-010-16-030B-R1	PLATE, 030B-R1	1
5	10-010-00-279-R1	BLOCK, 279	1
6	10-010-00-431C-R1	FRAME DRIVE ARM	1
7	10-010-00-433B-R1	ASSY, TENSIONING WHEEL	1
8	10-010-00-434B-R1	ASSY, IDLER WHEEL	2
9	10-010-00-003	LINEAR BEARING	3
10	10-010-00-010	TENSION KNOB	1
11	10-010-00-023	ROD, 023	1
12	10-010-00-024	SPACER, 024	2
13	10-010-00-260	ROD, 260	1
14	10-010-00-261	ROD, 261	1
15	10-010-16-038	SPACER, -038	2
16	10-010-16-070	DESCRIPTION	1
17	10-010-16-279	BAR, 279	1
18	10-010-36-038	ROD, 215	2
19	10-010-00-062	BALL JOINT ROD END	1
20	91831A029	NYLOCK NUT, 1/4-20, 18-8SS	2
21	90313A203	WASHER, 1/2" FENDER, SS	2
22	92196A542	SHCS 1/4"-20 x 1" LG, SS	2
23	92196A541	SHCS 1/4"-20 x 7/8" LG, SS	1
24	92240A625	HHCS 3/8"-16x 1-1/8"LG, SS	12
25	98017A199	3/8" WASHER, SS	22
26	93475A280	WASHER 10mm, SS	12
27	91287A375	HHCS M10 x 1.5, 45mm LG, SS	12
28	90145A539	1/4 x 5/8 LG. DOWEL PIN	4
29	90298A712	SHOULDER SCREW 3/8"-16 x 1" LG, SS	2
30	1860A032	WASHER 1/2", PH 17-4	1
31	92198A753	HHCS 1/2"-13x3.75" LG, SS	1
32	91831A137	LOCKNUT 1/2"-13, SS	2
33	98017A209	1/2 WASHER, SS	6
34	3609K2	ZINC ANODE	1
35	92198A723	HHCS, 1/2"-13 X 2-3/4" LNG., SS	1
36	92240A714	HHCS 1/2"-13 x 1.25" LG	2
37	Parker 16_C5OX-SS	ORB TO JIC ELBOW	1
38	Garlock 08FDU06	BUSHING	4
39	Parker 16-20_C5OX-SS	ORB TO JIC ELBOW	1





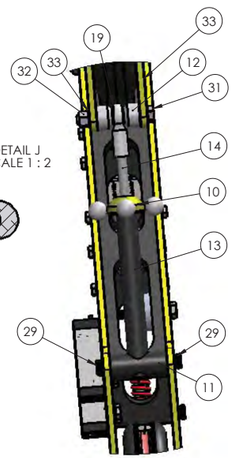


DETAIL B
SCALE 1 : 2

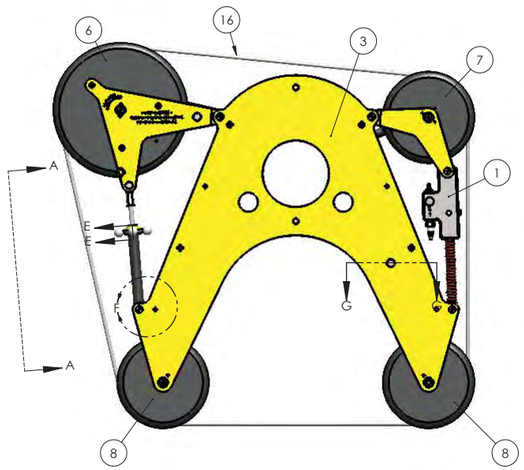


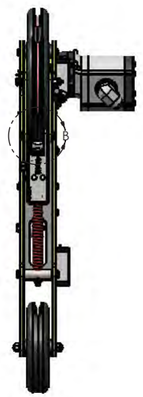
SECTION E-E
SCALE 1 : 2

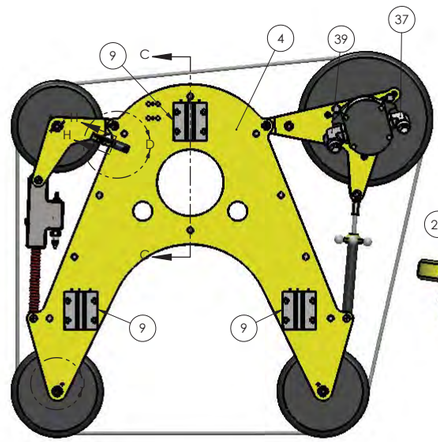
DETAIL J
SCALE 1 : 2

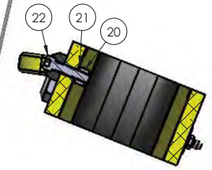


VIEW A-A
SCALE 1 : 4

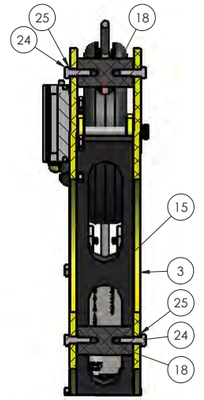








SECTION H-H
SCALE 1 : 2



SECTION C-C
SCALE 1 : 4

REV.	DESCRIPTION	DATE	APR.
3	RELEASED ROV VERSION	9/17/2014	Karl K
2	UPGRADE TO R1	5/1/2014	Karl K
1	PRODUCTION RELEASE	8/17/2010	JPW

REVISION HISTORY

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DO NOT SCALE DRAWING.

TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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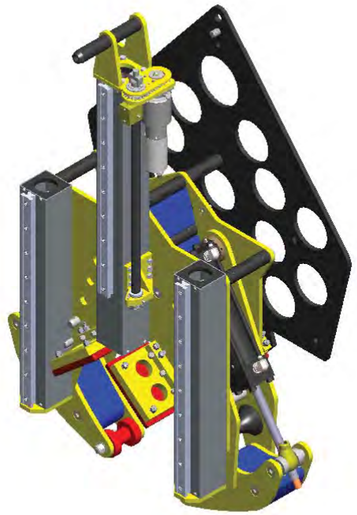
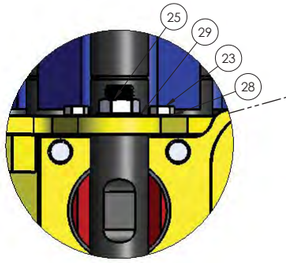
E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: DWDWS 416 BOW ASSEMBLY

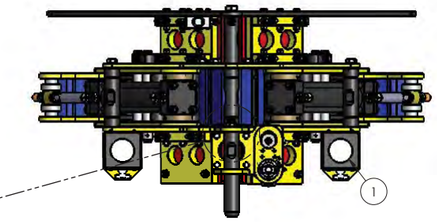
DRAWN BY	APPROVED BY	SCALE
J. WILLIAMS	KRP	1:8
DATE: 08/17/10	DATE: 08/17/10	SHEET: 1 OF 1

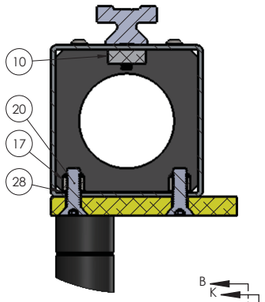
SIZE: D | DWG. NO.: 10-010-16-430-ROV | REV.: 3



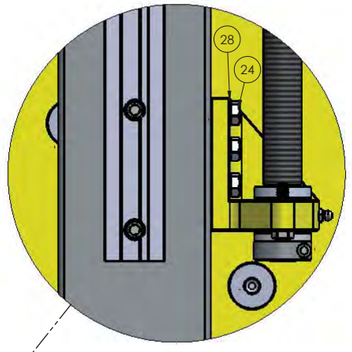


DETAIL E
SCALE 1 : 2

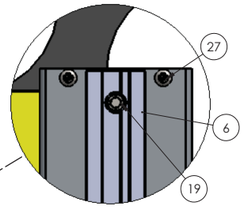




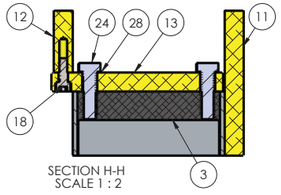
SECTION J-J
SCALE 1 : 2



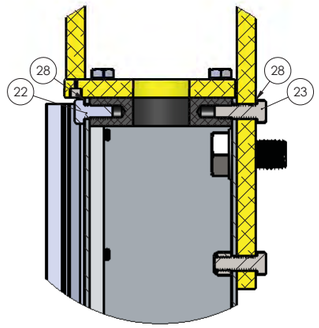
DETAIL D
SCALE 1 : 2



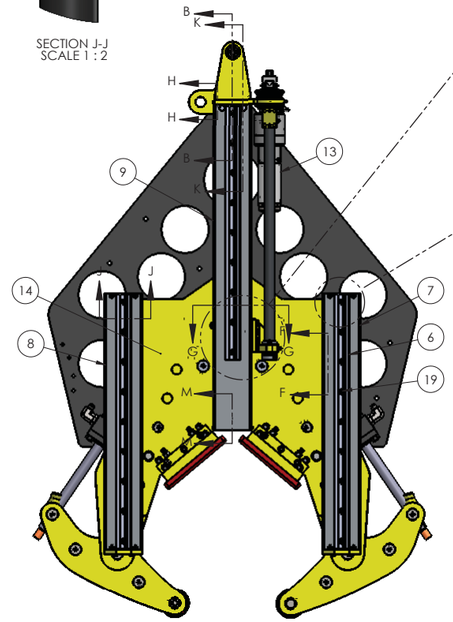
DETAIL C
SCALE 1 : 2

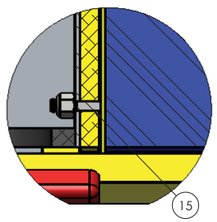


SECTION H-H
SCALE 1 : 2

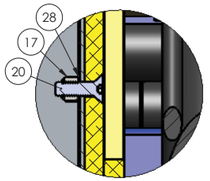


SECTION K-K
SCALE 1 : 2

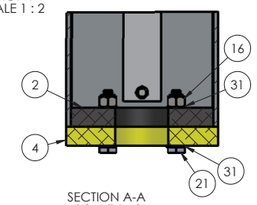




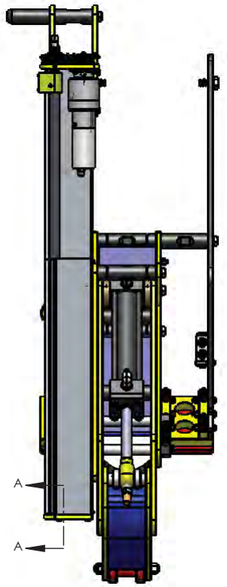
SECTION M-M
SCALE 1 : 2

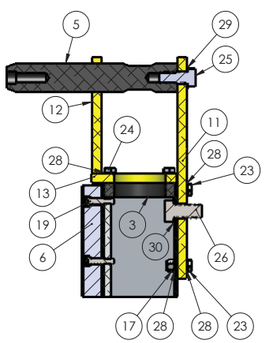


SECTION F-F
SCALE 1 : 2

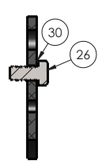


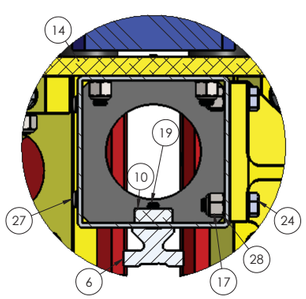
SECTION A-A
SCALE 1 : 2





SECTION B-B
SCALE 1 : 4





SECTION G-G
SCALE 1 : 2

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-027	PLATE, 027	3
2	10-010-00-027B	PLATE, 027B	2
3	10-010-00-028	PLATE, 028	1
4	10-010-00-029	PLATE, 029	2
5	10-010-00-251	ROD, 251	1
6	10-010-16-001	LINEAR GUIDE RAIL	3
7	10-010-16-020	TUBE, LINEAR GUIDE MOUNTING	1
8	10-010-16-020B	TUBE, LINEAR GUIDE MOUNTING	1
9	10-010-16-021	TUBE, LINEAR GUIDE MOUNTING	1
10	10-010-16-023	TAPPED RAIL	3
11	10-010-16-246-R1	PLATE, 246	1
12	10-010-16-246B-R1	PLATE, 246B	1
13	10-010-16-411-R1	FRAME FEED	1
14	10-010-16-420-ROV	CLAMP, 16" - 4" PIPE RANGE	1
15	90145A539	1/4 x 5/8 LG. DOWEL PIN	2
16	91831A029	NYLOCK NUT, 1/4-20, 18-8SS	8
17	91831A127	NUT, 3/8-16 SS NYLOCK	33
18	92196A539	SHCS 1/4"-20 x 5/8" LG, SS	4
19	92196A585	SHCS, 5/16-18 X 1-1/4, 18-8SS	27
20	92210A626	FSHCS 3/8"-16x1.25"LG,SS	25
21	92240A546	HHCS 1/4"-20x1.5"LG, SS	8
22	92240A622	HHSC 3/8"-16 x 3/4" LG, SS	2
23	92240A625	HHCS 3/8"-16x 1-1/8"LG, SS	4
24	92240A626	HHCS 3/8"-16x1.5"LG, SS	10
25	92240A798	HHCS 5/8"-11 x 1.5"LG, SS	1
26	92240A839	HHCS 3/4"-10 x 1.5"LG, SS	2
27	92949A537	BSHCS 1/4"-20x1/2"LG, SS	20
28	98017A199	3/8" WASHER, SS	49
29	98017A215	5/8 WASHER, SS	1
30	98017A220	3/4" WASHER, SS	2
31	98017A655	1/4" WASHER, SS	16

REV.	DESCRIPTION	DATE	APR.
3	RELEASED ROV VERSION	9/17/2014	Karl K.
2	UPGRADE TO R1	5/1/2014	Karl K.
1	PRODUCTION RELEASE	8/30/2010	AG

REVISION HISTORY

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TOLERANCES:
FRACTIONS ± 1/32
ONE PLACE DECIMAL ± .015
TWO PLACE DECIMAL ± .010
THREE PLACE DECIMAL ± .005
ANGULAR ± 0.5 MIN.

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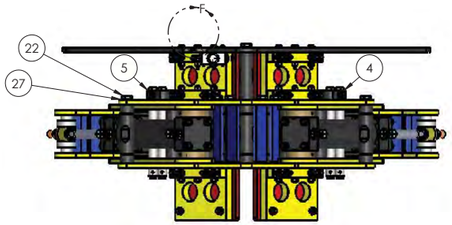
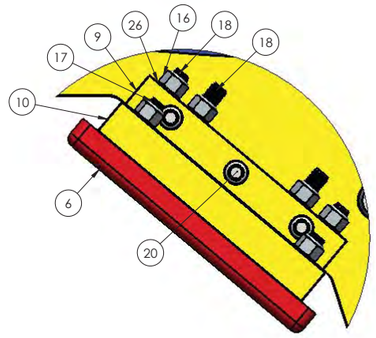
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: DWDWS 416 CLAMP ASSEMBLY

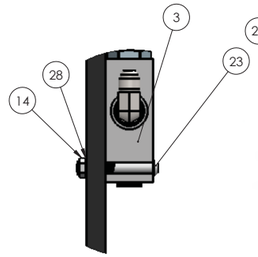
DRAWN BY	APPROVED BY	SCALE
J. WILLIAMS	KRP	1:8
DATE: 8/11/10	DATE: 8/11/10	SHEET: 1 OF 1

SIZE: D | DWG. NO.: 10-010-16-410-ROV | REV.: 3

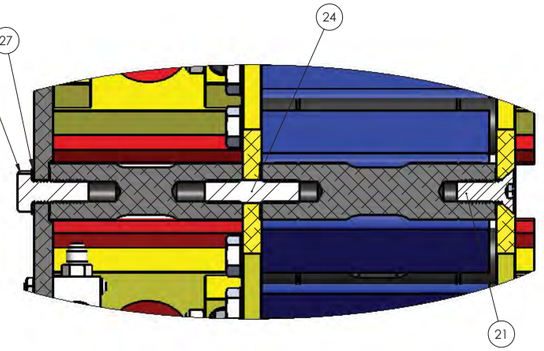




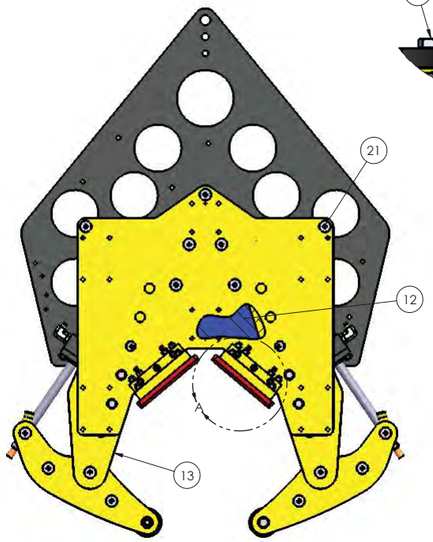
DETAIL A
SCALE 1 : 2

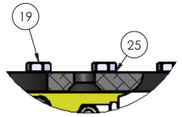


DETAIL C
SCALE 1 : 2

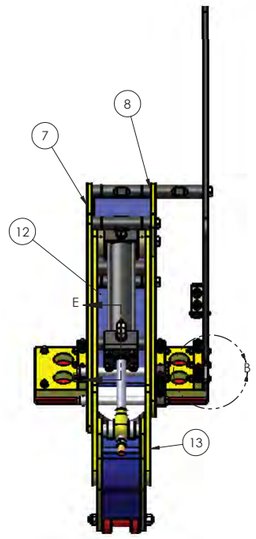


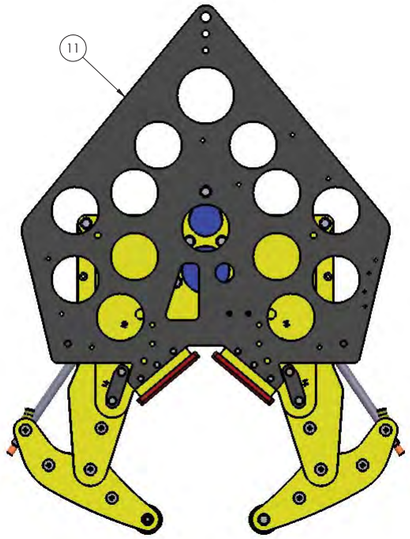
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-209-R1	ROD,209-R1	7
2	10-010-00-215	ROD, 215	1
3	10-010-00-419B	Flow Divider Combiner Valve Assembly	1
4	10-010-16-110-LH	CLAMP PIN FORK - LH	1
5	10-010-16-110-RH	CLAMP PIN FORK - RH	1
6	10-010-16-221	SHOE, 221	4
7	10-010-16-203A-R1	PLATE, 203A	1
8	10-010-16-203B-R1	PLATE, 230B	1
9	10-010-16-211-R1	BAR, 211	6
10	10-010-16-220-R1	PLATE, 220	2
11	10-010-16-305	PLATE, 305 ROV	1
12	10-010-16-307	16 DWDWS CENTER FLOTATION	1
13	10-010-16-421-ROV	ADJUSTABLE CLAMP WITH ACTUATOR,DWDWS	2
14	90101A230	NUT, NYLOCK JAM 1/4-20	2
15	91831A127	LOCKNUT 3/8"-16, SS	18
16	91831A133	HEX LOCKNUT 7/16"-14, SS	28
17	92186A677	HHCS, 7/16-14 X 2" (316 SS)	4
18	92186A681	HHCS, 7/16-14 X 3" (316 SS)	24
19	92198A633	HHCS 3/8"-16 x 2.25" LG, SS	6
20	92210A632	FHCS 3/8"-16 x 2" LG	12
21	92210A798	FHCS, 5/8"-11 X 1-1/2" LNG., SS	7
22	92240A798	HHCS 5/8"-11 x 1.5"LG, SS	7
23	92949A550	BHCS, 1/4-20 x 2" LNG.	2
24	95412A804	5/8-11 x 1.5" LG. STUD	1
25	98017A199	3/8" WASHER, SS	24
26	98017A204	7/16 WASHER,SS	56
27	98017A215	5/8 WASHER, SS	7
28	98017A655	1/4" WASHER, SS	2



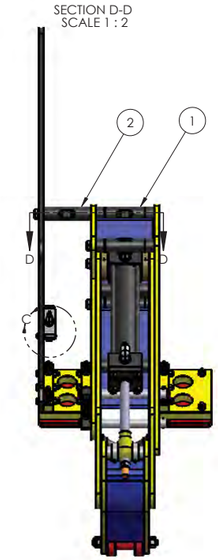


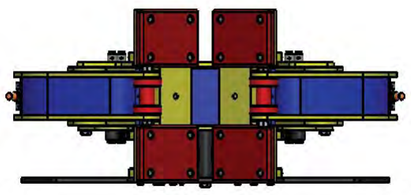
DETAIL F
SCALE 1 : 2

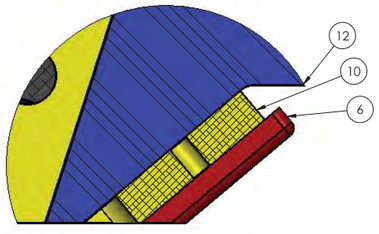




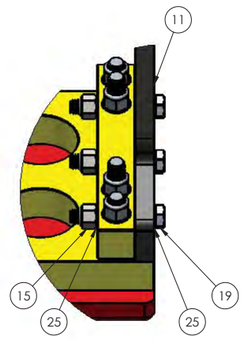
SECTION D-D
SCALE 1 : 2







SECTION E-E
SCALE 1 : 2



DETAIL B
SCALE 1 : 2

REV.	DESCRIPTION	DATE	APR.
3	RELEASED ROV VERSION	9/17/2014	Karl K
2	UPGRADE TO R1	5/1/2014	Karl K
1	RELEASED FOR PRODUCTION	8/18/2010	JPW

REVISION HISTORY

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TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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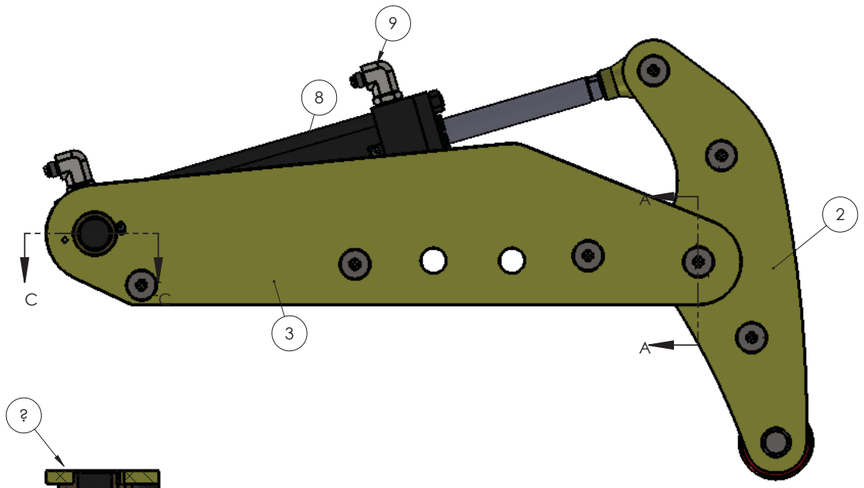
E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

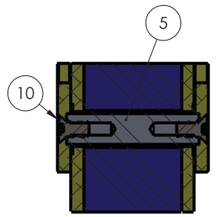
TITLE: CLAMP, 16" - 4" PIPE RANGE

DRAWN BY	APPROVED BY	SCALE
J. WILLIAMS	KRP	1:8
DATE: 08/17/10	DATE: 08/17/10	SHEET: 1 OF 1

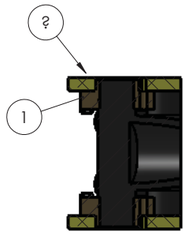
SIZE: D | DWG. NO.: 10-010-16-420-ROV | REV.: 3

ITEM NO.	PART NUMBER	DESCRIPTION	Default/ QTY.
1	10-010-00-205-R1	BUSHING, CYLINDER	2
2	10-010-16-422-ROV	CLAMP ARM ASSEMBLY, DWDWS	1
3	10-010-16-202-R1	PLATE, 202	1
4	10-010-16-202B-R1	PLATE, 202B	1
5	10-010-00-207	ROD,207	1
6	10-010-00-213	SPACER, 213	1
7	10-010-00-215	ROD, 215	2
8	10-010-16-248	HYDRAULIC CYLINDER	1
9	Parker 6-10_c5OX-S	ORB-JIC ELBOW	2
10	92210A796	FHCS 5/8"-11x 1.25" LG.	8
11	92198A544	HHCS 1/4"-20 x 1.25" LG	2

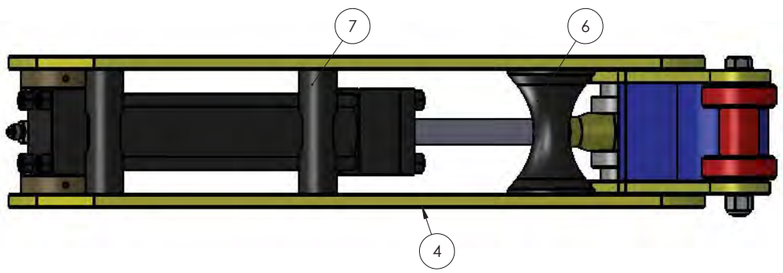


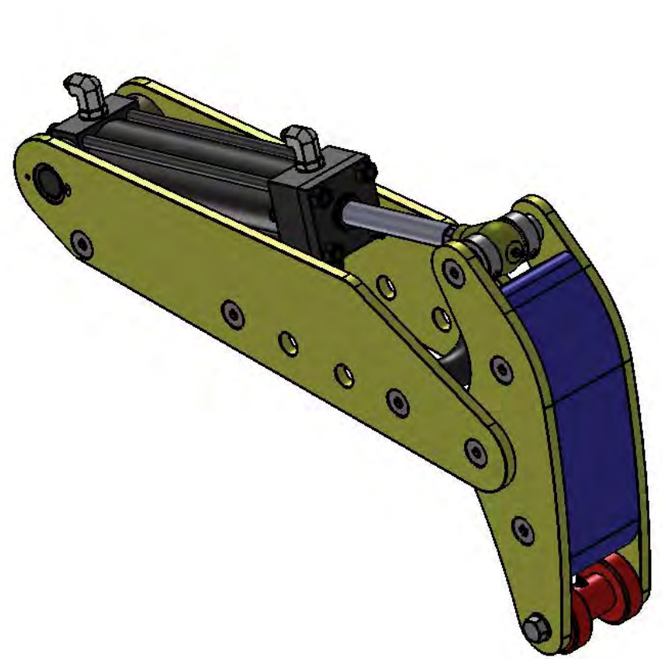


SECTION A-A



SECTION C-C





REV.	DESCRIPTION	DATE	APR.
3	RELEASED ROV VERSION	9/17/2014	Karl K
2	UPGRADE TO R1	4/30/2014	Karl K
1	RELEASED FOR PRODUCTION	8/18/2010	JPW

REVISION HISTORY

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DO NOT SCALE DRAWING.

TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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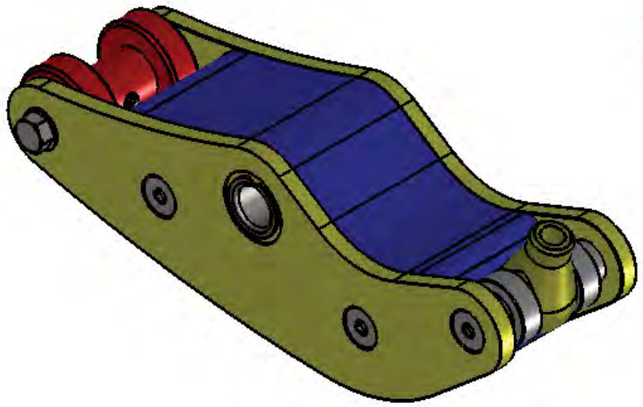
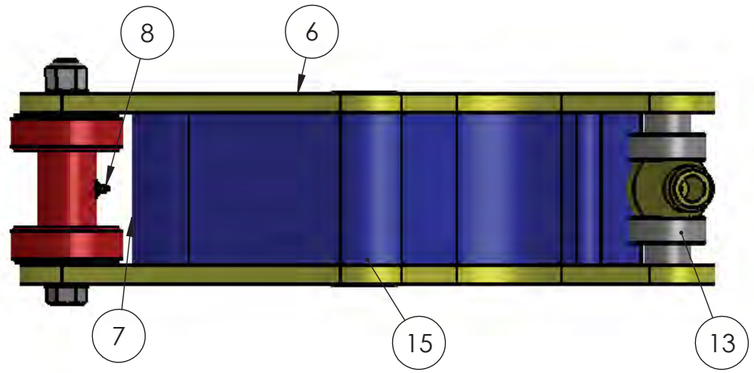
E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: ADJUSTABLE CLAMP WITH ACTUATOR,DWDWS

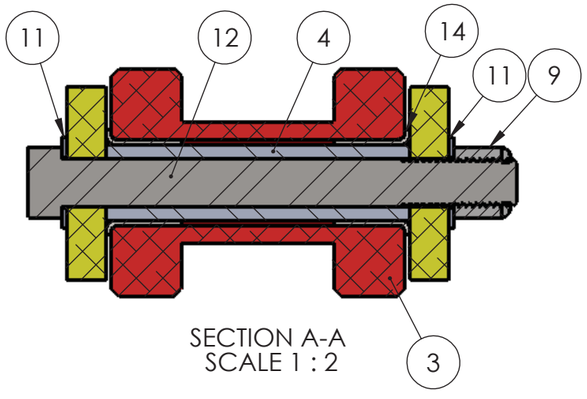
DRAWN BY	APPROVED BY	SCALE
J. WILLIAMS	KRP	1:4
DATE 08/18/10	DATE 08/18/10	SHEET 1 OF 1

SIZE	DWG. NO.	REV.
C	**10-010-16-421-ROV**	3

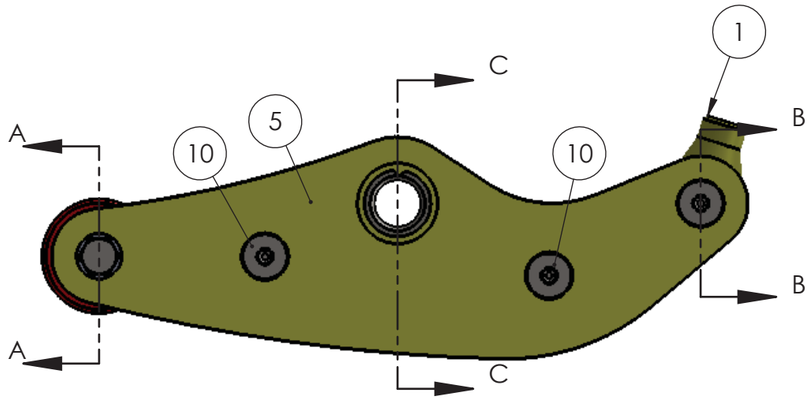


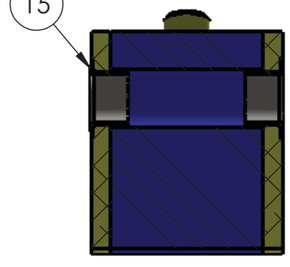


ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-204	ROD END, CYLINDER	1
2	10-010-00-206	ROD, 206	1
3	10-010-00-208	ROLLER	1
4	10-010-00-210	TUBE, 210	1
5	10-010-16-201-R1	PLATE, 201	1
6	10-010-16-201B-R1	PLATE, 201B	1
7	10-010-16-442	16 DWDWS CLAMP FLOTATION	1
8	1293K21	1/4-28 GREASE FITTING; SS	2
9	90715A185	LOCKNUT 5/8"-11,SS	1
10	92210A796	FHCS 5/8"-11x 1.25" LG.	6
11	98017A215	5/8 WASHER, SS	2
12	92198A818	HHCS 5/8-11 x 6" LG, SS	1
13	6462K29	SHAFT COLLAR	2
14	Garlock 16FDU16	BUSHING	2
15	Garlock 20FDU16	BUSHING	2

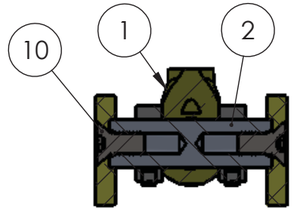


SECTION A-A
SCALE 1 : 2





SECTION C-C



SECTION B-B

REV.	DESCRIPTION	DATE	APR.
3	RELEASED ROV VERSION	9/17/2014	Karl K
2	UPGRADE TO R1	4/29/2014	Karl K
1	RELEASED FOR PRODUCTION	8/18/2010	JPW

REVISION HISTORY

UNLESS OTHERWISE SPECIFIED:
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E.H. WACHS WORKMANSHIP STANDARDS (WI 17-01) SHALL APPLY TO ALL ITEMS NOT SPECIFIED ON DRAWING.
DO NOT SCALE DRAWING.

TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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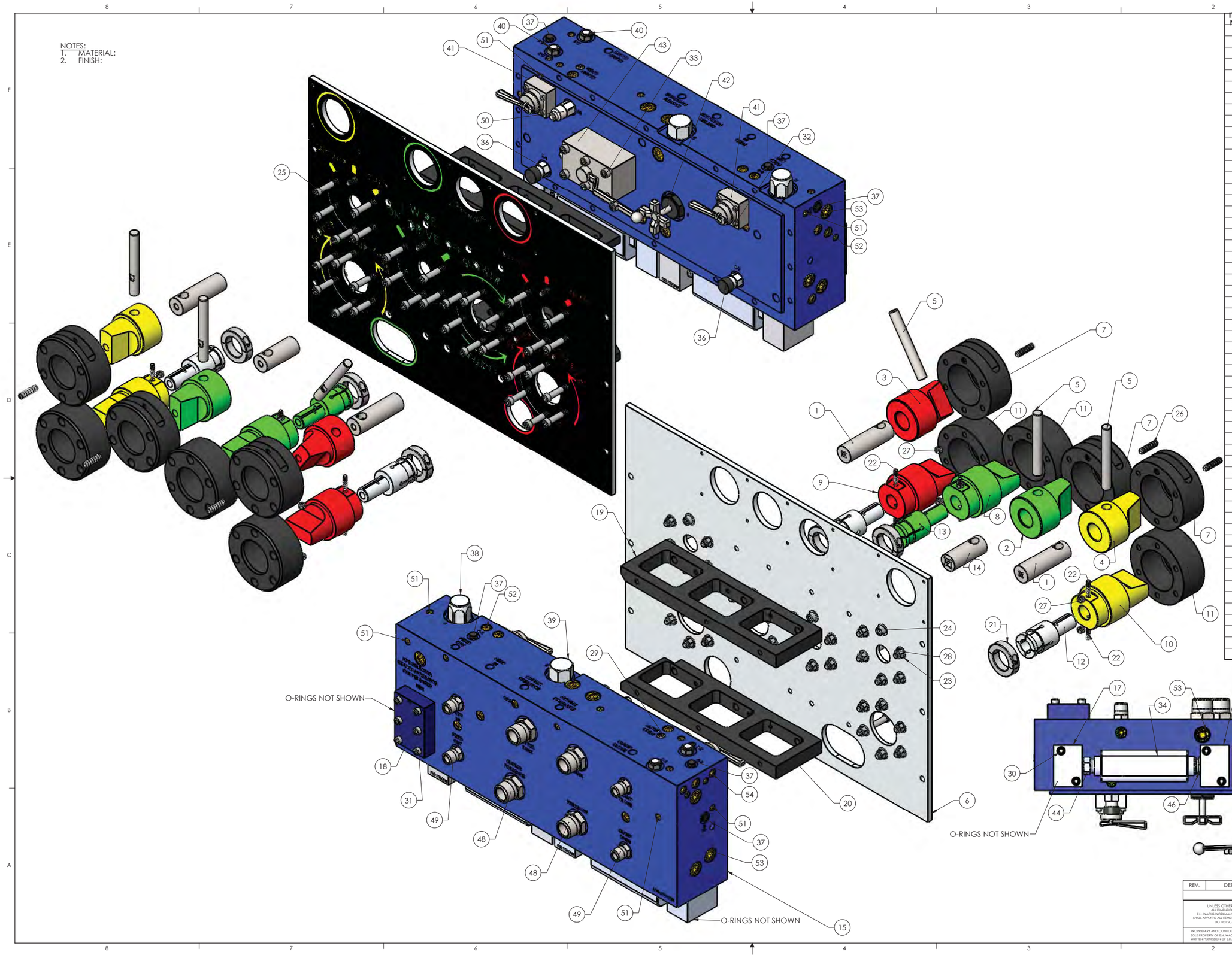
E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: CLAMP ARM ASSEMBLY, DWDWS

DRAWN BY	APPROVED BY	SCALE
J. WILLIAMS	KRP	1:4
DATE: 08/18/10	DATE: 08/18/10	SHEET: 1 OF 1

SIZE	DWG. NO.	REV.
B	**10-010-16-422-ROV**	3

NOTES:
1. MATERIAL:
2. FINISH:



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	H10-084-101	SHAFT, INTERMEDIATE	2
2	H10-084-102G	DESCRIPTION	1
3	H10-084-102R	DESCRIPTION	1
4	H10-084-102Y	KNOB, ROV	1
5	H10-084-103	PIN, STOP	3
6	H10-084-104A	PANEL, ROV INTERFACE	1
7	H10-084-105	HOUSING, KNOB	3
8	H10-084-109G	DESCRIPTION	1
9	H10-084-109R	DESCRIPTION	1
10	H10-084-109Y	DESCRIPTION	1
11	H10-084-111	HOUSING, KNOB	3
12	H10-084-112	SHAFT, CLUTCH	2
13	H10-084-113	SHAFT, CLUTCH	1
14	H10-084-114	SHAFT, INTERMEDIATE	1
15	H10-023-001	Universal Manifold	1
16	H10-023-002	BLOCK, MOUNTING	2
17	H10-023-003	BLOCK, MOUNTING	2
18	H10-023-005	BLOCK, SEAL	1
19	10-010-00-327A	ROV CONTROL STANDOFF A	1
20	10-010-00-327B	ROV CONTROL STANDOFF B	1
21	6436K75	1-1/2" COLLAR	3
22	8688A152	1/4-20 SPRING PLUNGER	6
23	91950A031	3/8 FLAT WASHER	36
24	92185A624	3/8-16X1", SHCS	3
25	92185A634	3/8-16X2-1/2", SHCS	33
26	92311A628	3/8-16X1-1/2", SET SCREW	3
27	94804A029	1/4-20, HEX NUT	6
28	94804A320	5/16-16, HEX NUT	33
29	4464K562	302 SS, 1/4 Pipe Size, Hex-Socket Plug, 150 PSI	1
30	92185A597	Type 316 SS SHCS 5/16"-18 Th, 3" L	8
31	92185A589	Type 316 SS SHCS 5/16"-18 Th, 1-3/4" L	6
32	92185A251	Type 316 SS SHCS 10-24 Thr, 1-1/2" L	8
33	92185A636	Type 316 SS SHCS 3/8"-16 Thr, 3" L	6
34	H600A-010	1-10GPM, 3500PSI FLOW METER	1
35	H700A-030	1-30GPM, 3500PSI FLOW METER	1
36	FA101K	ADJUSTABLE FLOW CONTROL	2
37	CS041B	SHUTTLE CARTRIDGE	4
38	16SLC2-A-150	LOGIC VALVE PILOT TO CLOSE	1
39	R06H3	DIVERTER VALVE	1
40	CP084P	SINGLE PO CHECK VALVE	2
41	8473E-6D2	MINI LO TORQUE VALVE	2
42	NV162K	NEEDLE VALVE	1
43	BBV25120101	3/4" BALL VALVE	1
44	10_f5ox-s	STRAIGHT THREAD CONNECTOR	1
45	12_f5ox-s	STRAIGHT THREAD CONNECTOR	1
46	P-10-GCU	#10 SAE UNION	1
47	P-12-GCU	#12 SAE UNION	1
48	16_1_F5F	STRAIGHT MALE PIPE ADATER, 1"	4
49	8_1-2_F5F	STRAIGHT MALE PIPE ADAPTER, 1/2"	4
50	RDH103S50	-10 D.A RELIEF VALVE	1
51	SAE2P	SAE 02 PLUG	18
52	SAE6P	SAE 06 PLUG	14
53	SAE10P	SAE 10 PLUG	14
54	SAE4P	SAE 04 PLUG	5
55	3-916	O-RING	4
56	3-908	O-RING	4

REV.	DESCRIPTION	DATE	APR.
REVISION HISTORY			

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E.H. WACHS WORKMANSHIP STANDARDS (WI 17-01) SHALL APPLY TO ALL ITEMS NOT SPECIFIED ON DRAWING.
DO NOT SCALE DRAWING.

TOLERANCES:
FRACTIONAL ± 1/32
ONE PLACE DECIMAL ± .015
TWO PLACE DECIMAL ± .010
THREE PLACE DECIMAL ± .005
ANGULAR ± 1/2 MIN.

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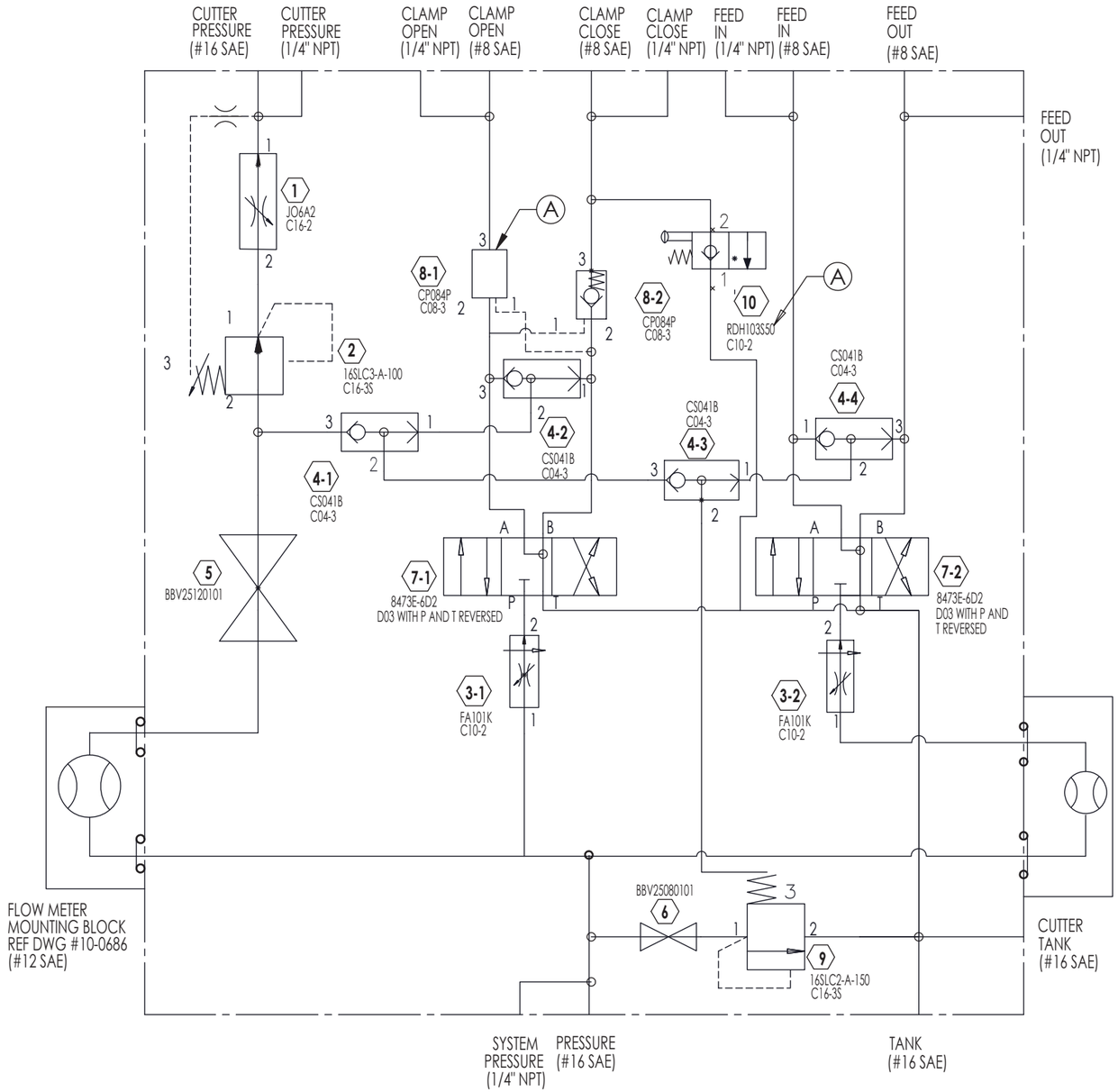
E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: ROV INTERFACE PANEL

DRAWN BY	APPROVED BY	SCALE
Drawn by Initials	Approved by Initials	1:3
DATE: Date	DATE: Date	SHEET: 1 OF 1

SIZE: D | DWG. NO.: H10-084-200-A | REV.:

NOTES:
1. MATERIAL: H10-023-001
2. FINISH: N/A
3. REF.: 10-0687 SCHEMATIC
4. 8-1 : CHECK VALVE DEFEATED (REMOVE CENTER O-RING AND TEFLON RINGS), PORTING STILL EXIST


CUTTER PRESSURE (#16 SAE)
CUTTER PRESSURE (1/4" NPT)
CLAMP OPEN (1/4" NPT)
CLAMP OPEN (#8 SAE)
CLAMP CLOSE (#8 SAE)
CLAMP CLOSE (1/4" NPT)
FEED IN (1/4" NPT)
FEED IN (#8 SAE)
FEED OUT (#8 SAE)
FEED OUT (1/4" NPT)
1 J06A2 C16-2
2 16SLC3-A-100 C16-3S
3 BBV25120101
4-1 CS041B C04-3
4-2 CS041B C04-3
4-3 CS041B C04-3
4-4 CS041B C04-3
7-1 8473E-6D2 D03 WITH P AND T REVERSED
7-2 8473E-6D2 D03 WITH P AND T REVERSED
8-1 CP084P C08-3
8-2 CP084P C08-3
10 RDH103S50 C10-2
3-1 FA101K C10-2
3-2 FA101K C10-2
6 BBV25080101
9 16SLC2-A-150 C16-3S
FLOW METER MOUNTING BLOCK REF DWG #10-0686 (#12 SAE)
FLOW METER MOUNTING BLOCK REF DWG #10-0685 (#10 SAE)
CUTTER TANK (#16 SAE)
SYSTEM PRESSURE (1/4" NPT)
PRESSURE (#16 SAE)
TANK (#16 SAE)

FLOW SCHEMATIC

VALVES:
1. PARKER NV162 OR J06A2; Needle Valve, Cutter drive flow/speed
2. PARKER 16SLC3-A-100; Logic element N.O., Cutter drive load sense
3. PARKER FA101K; Flow control, FF check, Clamp and feed flow/speed
4. PARKER CS041B; Shuttle valve, Gear pump releif system
5. STAUFF BBV25120101;
6. STAUFF BBV25080101;
7. PARKER 8473E-6D2 (P & T ARE REVERSED);
8. PARKER CP084P;
9. PARKER 16SLC2-A-150; Logic element, N.C.,
10. PARKER RDH103S50; Relief valve, 2500PSI, Clamp max press (controls spikes)

PORTS:
(SEE FLOW SCHEMATIC)

REV.	DESCRIPTION	DATE	APR.
A	CHANGE DL101K TO RDH103S50, REMOVE CHECK VALVE FROM 8-1	4/19/2012	

REVISION HISTORY

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WACHS SUBSEA
11050 West Little York, Building N
Houston, TX 77041
www.wachssubsea.com

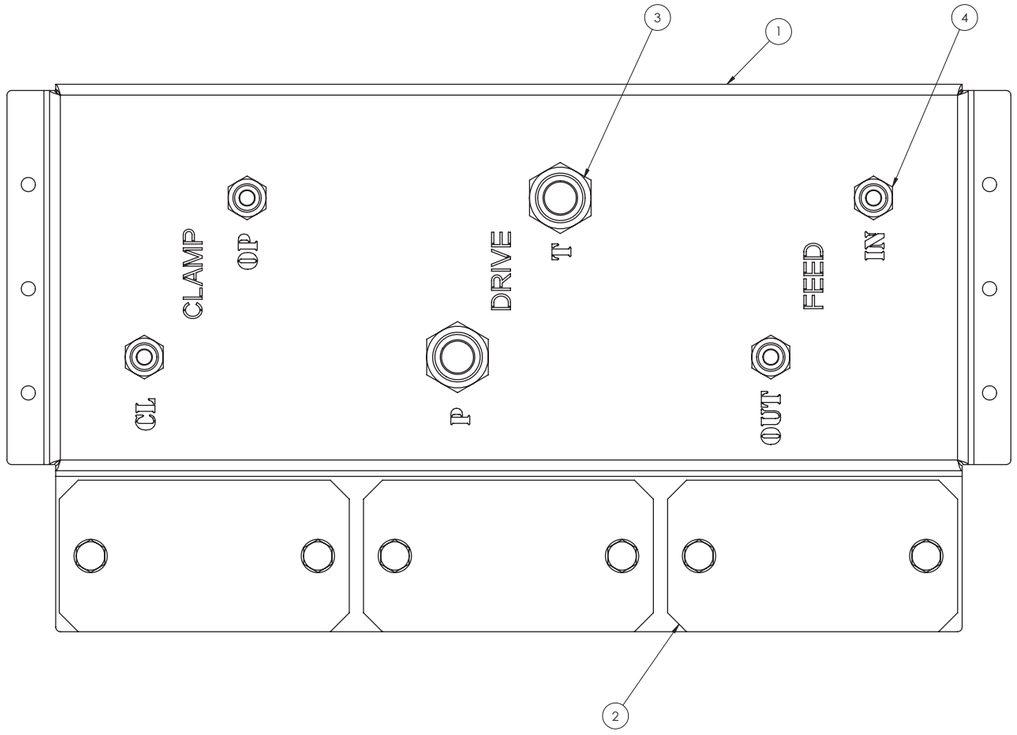
TITLE: SCHEMATIC, WSS UNIV. HYD. MANIFOLD

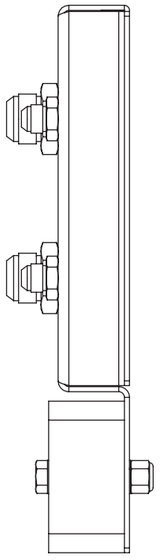
DRAWN BY	APPROVED BY	SCALE
SN		1:1
DATE	DATE	SHEET
06/24/2013		1 OF 1

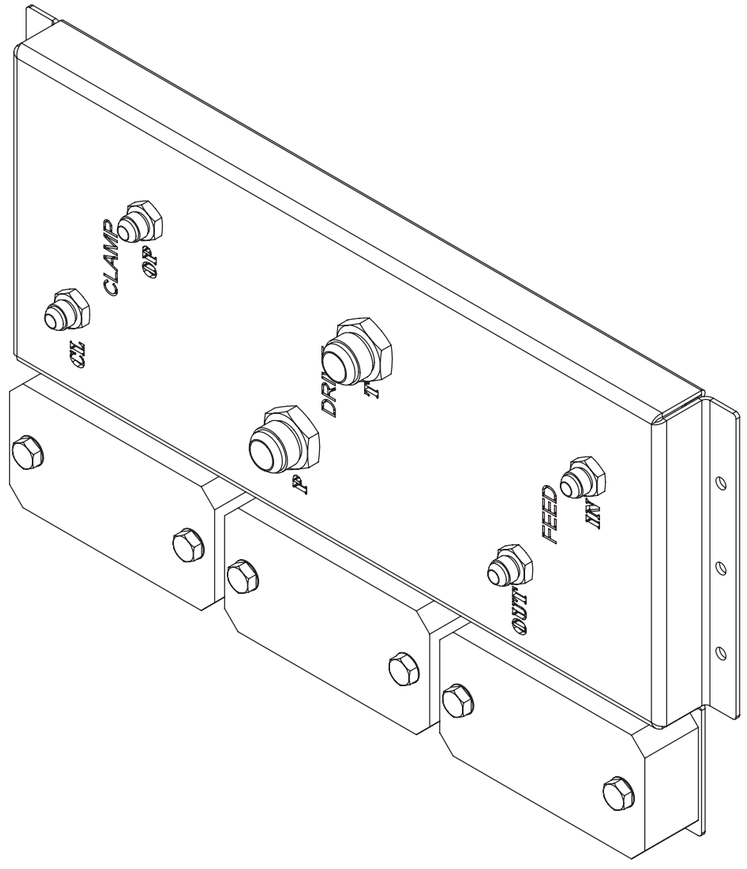
SIZE	DWG. NO.	REV.
B	**H10-023-001-SCH**	A

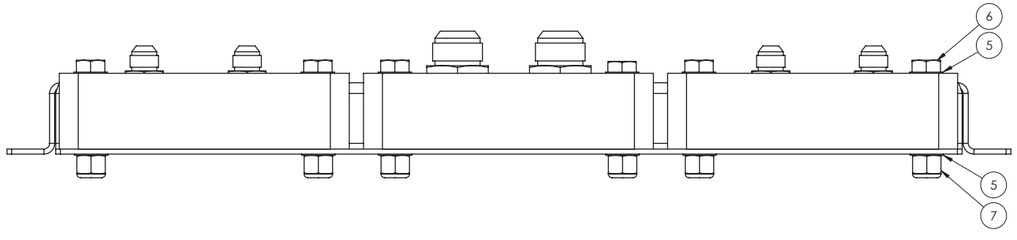
NOTES:
1. MATERIAL:
2. FINISH:

ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	10-010-00-321	ROV SAW BULKHEAD PANEL	1
2	10-010-00-320	2 X4 X 8 LEAD WEIGHT	3
3	16_wtx_SS	PARKER -16 BULKHEAD FITTING	2
4	8_wtx_SS	PARKER-8 BULKHEAD FITTING	4
5	98017A209	1/2 WASHER, SS	12
6	92186A723	1/2-13 x 2-3/4 HHCS 316SS	6
7	91831A137	LOCKNUT 1/2"-13, SS	6









REV.	DESCRIPTION	DATE	APR.
1	RELEASED FOR PRODUCTION	10/21/2014	Karl K

REVISION HISTORY

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THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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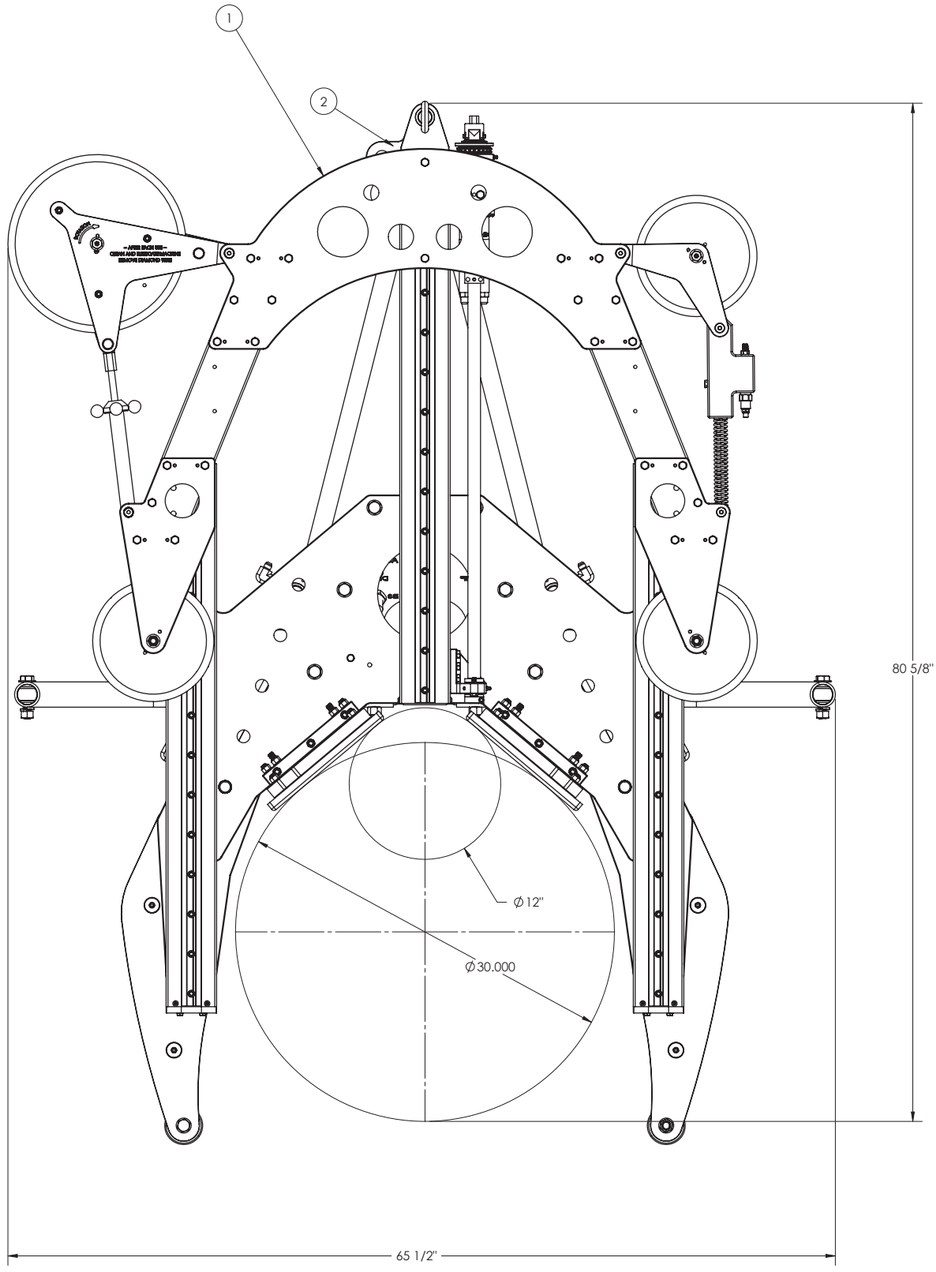
E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

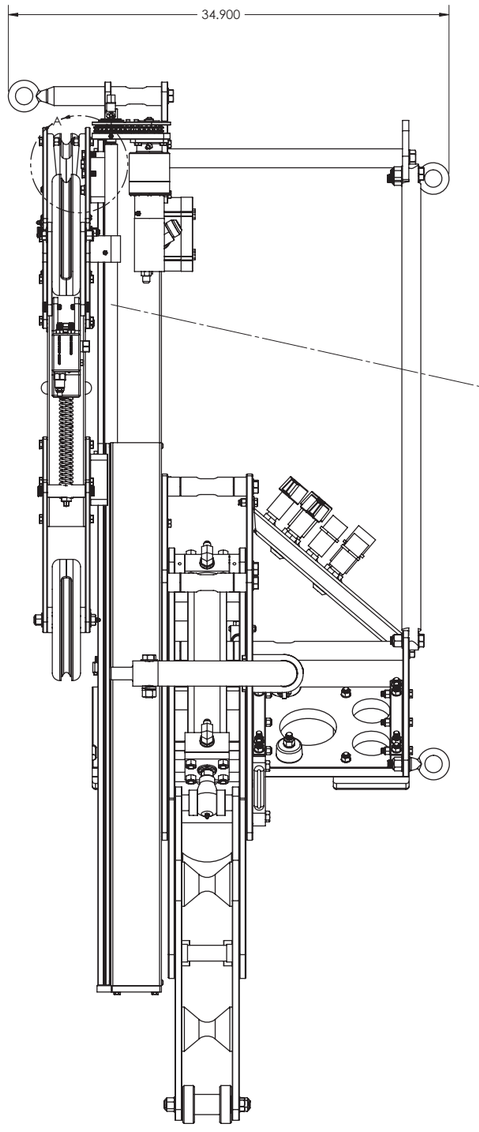
TITLE: DWDWS BULKHEAD ASSEMBLY

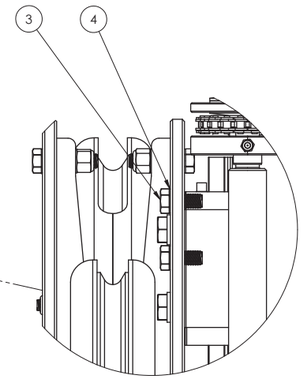
DRAWN BY	APPROVED BY	SCALE
Karl K	-	1:2
DATE: 10/17/2014	DATE:	SHEET: 1 OF 1

SIZE	DWG. NO.	REV.
D	10-010-16-322	1

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-30-430-R1	FRAME BOW	1
2	10-010-30-410-R1	FRAME ASSEMBLY	1
3	92240A623	HHCS 3/8"-16x7/8" LG,SS	4
4	98017A199	3/8" WASHER, SS	4







DETAIL A
SCALE 1 : 2

APPROXIMATE WEIGHT IN AIR 720#(327kg)
APPROXIMATE WEIGHT IN WATER 532#(241kg)

REV.	DESCRIPTION	DATE	APR.
2	UPDATE TO R-1	1/16/2015	Karl K
1	PRODUCTION RELEASE	11/24/2009	KRP

REVISION HISTORY

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DO NOT SCALE DRAWING.

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FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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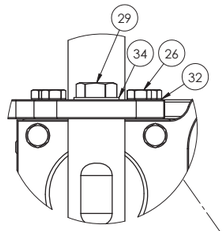
E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: WS 3012 GENERAL ARRANGEMENT

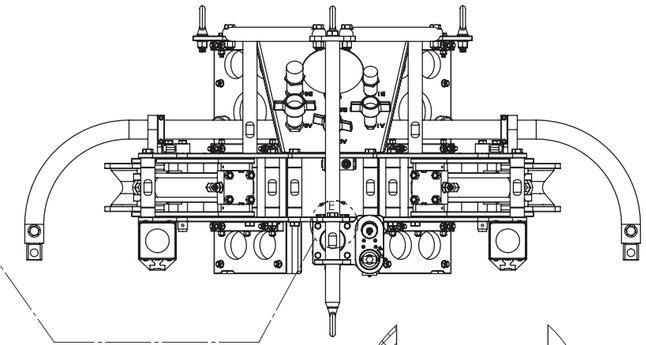
DRAWN BY	APPROVED BY	SCALE
AG	.	1:6
DATE 11/24/09	DATE .	SHEET 1 OF 1

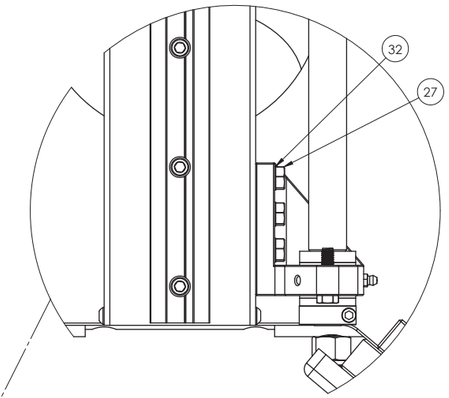
SIZE	DWG. NO.	REV.
D	10-010-530-R1	2

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-027	PLATE, 027	3
2	10-010-00-027B	PLATE, 027B	2
3	10-010-00-028	PLATE, 028	1
4	10-010-00-029	PLATE, 029	2
5	10-010-00-243-R1	PLATE, 243-R1	1
6	10-010-00-246-R1	PLATE, 246-R1	1
7	10-010-00-246B-R1	PLATE, 246B-R1	1
8	10-010-00-251	ROD, 251	1
9	10-010-30-001	LINEAR GUIDE RAIL	3
10	10-010-30-020	TUBE, LINEAR GUIDE MOUNTING	2
11	10-010-30-021	TUBE, LINEAR GUIDE MOUNTING	1
12	10-010-30-023	TAPPED RAIL	3
13	10-010-30-242	ROD, 242	1
14	10-010-30-247	BAR, LIFTING	2
15	10-010-30-411-R1	FRAME FEED	1
16	10-010-30-420-R1	CLAMP, 30"-12" PIPE RANGE	1
17	3014T867	EYEBOLT	4
18	90715A185	LOCKNUT 5/8"-11,SS	7
19	91831A029	LOCKNUT 1/4"-20, SS	8
20	91831A127	NUT, 3/8-16 SS NYLOCK	32
21	92196A539	SHCS 1/4"-20 x 5/8" LG, SS	4
22	92196A585	SHCS 5/16"-18x1.25"LG, SS	42
23	92198A803	HHCS 5/8"-11 x 2.25" LG, SS	4
24	92210A626	FSHCS 3/8"-16x1.25"LG,SS	17
25	92240A546	HHCS 1/4"-20x1.5"LG, SS	8
26	92240A625	HHCS 3/8"-16x 1-1/8"LG, SS	4
27	92240A626	HHCS 3/8"-16x1.5"LG, SS	18
28	92240A714	HHCS 1/2"-13 x 1.25" LG	1
29	92240A798	HHCS 5/8"-11 x 1.5"LG, SS	3
30	92240A839	HHCS 3/4"-10 x 1.5"LG, SS	2
31	92949A537	BSHCS 1/4"-20x1/2"LG, SS	20
32	98017A199	3/8" WASHER, SS	56
33	98017A209	1/2 WASHER, SS	1
34	98017A215	5/8 WASHER, SS	17
35	98017A220	3/4" WASHER, SS	2
36	98017A655	1/4" WASHER, SS	16
37	92240A622	HHSC 3/8"-16 x 3/4" LG, SS	2

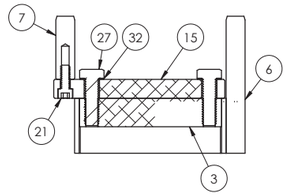


DETAIL E
SCALE 1 : 2

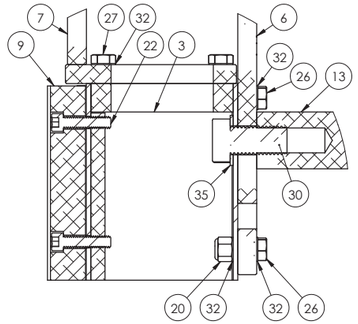




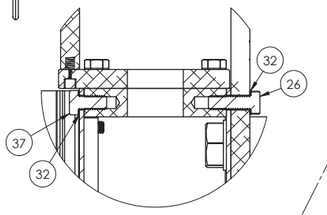
DETAIL D
SCALE 1 : 2



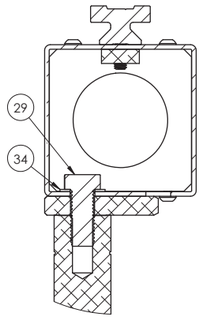
SECTION H-H
SCALE 1 : 2



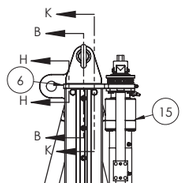
SECTION B-B
SCALE 1 : 2

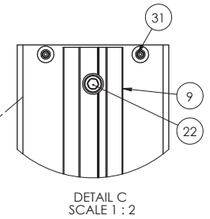


SECTION K-K
SCALE 1 : 2

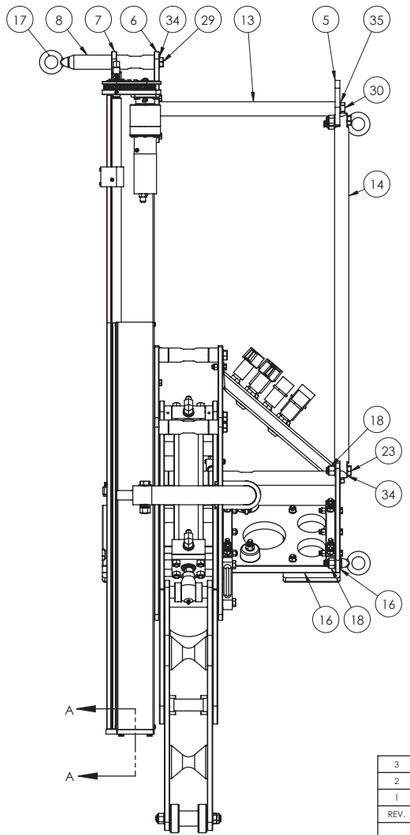


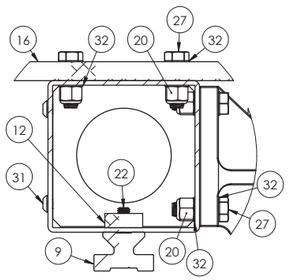
SECTION J-J
SCALE 1 : 2



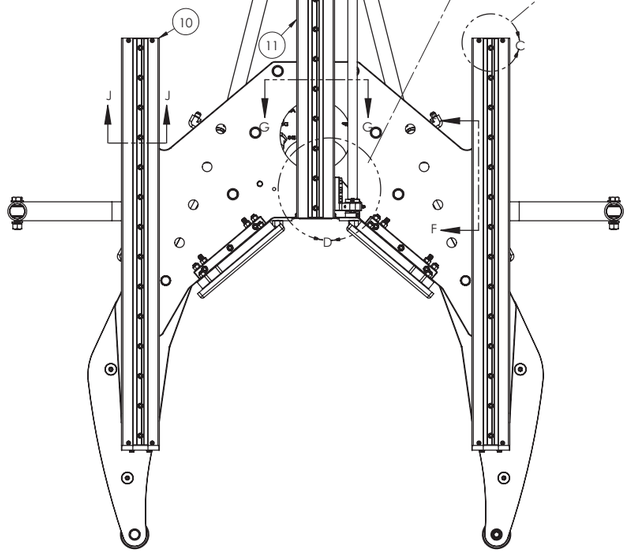


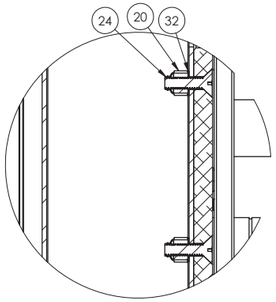
DETAIL C
SCALE 1 : 2



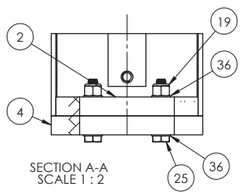


SECTION G-G
SCALE 1 : 2





SECTION F-F
SCALE 1 : 2



SECTION A-A
SCALE 1 : 2

REV.	DESCRIPTION	DATE	APR.
3	UPDATE TO R-1	1/16/2015	Karl K
2	ADDED TAPPED RAIL	8/5/2010	JPW
1	PRODUCTION RELEASE	11/24/2009	KRP

REVISION HISTORY

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TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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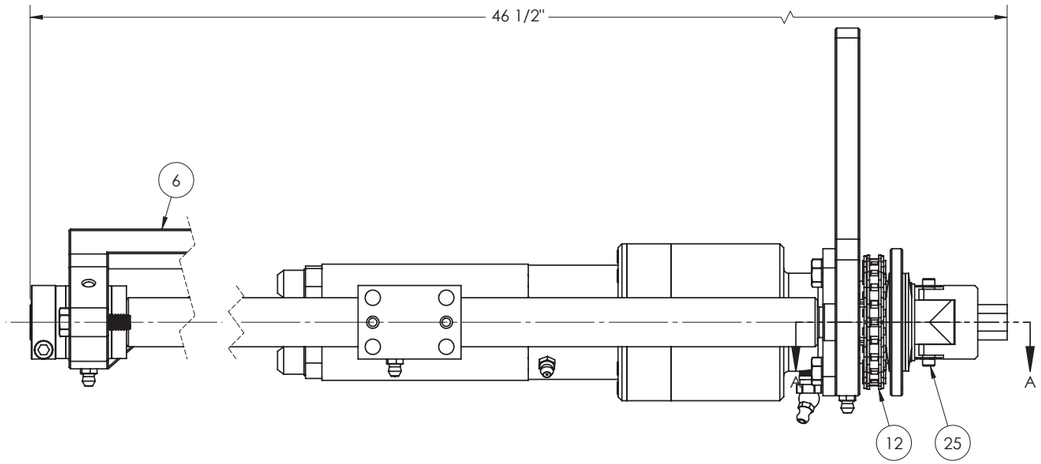
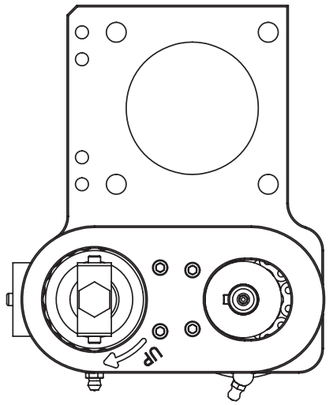
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: FRAME ASSEMBLY

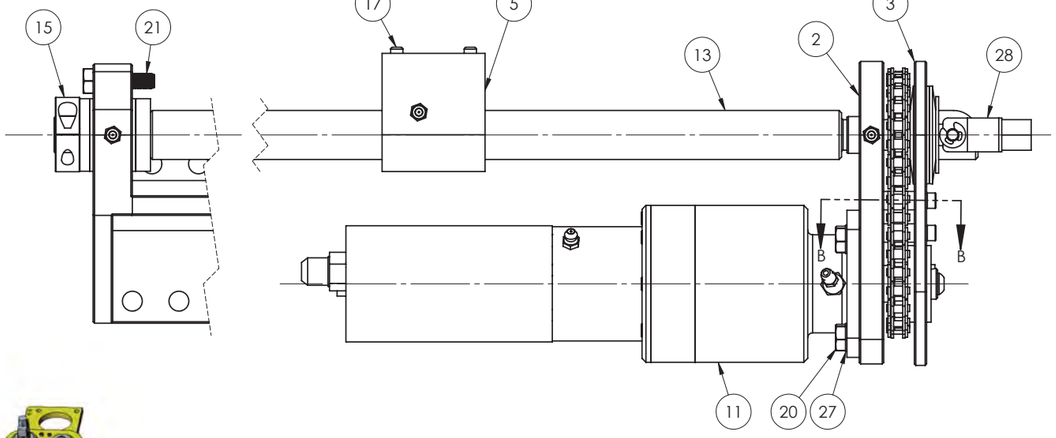
DRAWN BY	APPROVED BY	SCALE
AG	.	1:8
DATE: 11/24/09	DATE: .	SHEET: 1 OF 1

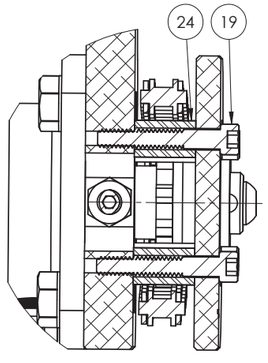
SIZE	DWG. NO.	REV.
D	10-010-30-410-R1	3



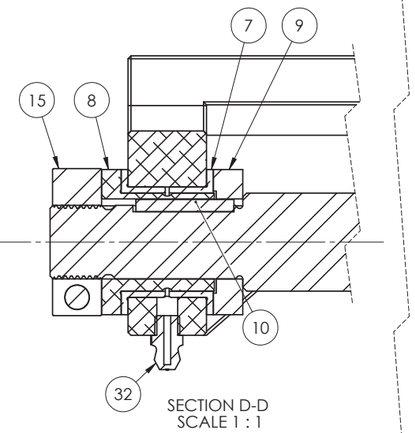


ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-019	KEY	1
2	10-010-00-041-R1	PLATE, 041-R1	1
3	10-010-00-042-R1	PLATE, 042-R1	1
4	10-010-00-043	BUSHING, FEED	1
5	10-010-00-044	NUT, FEED	1
6	10-010-00-045-R1	BLOCK, FEED SCREW MOUNTING	1
7	10-010-00-046	BUSHING, FEED	2
8	10-010-00-047	RETAINER, FEED SCREW	1
9	10-010-00-048	WASHER, 048	1
10	10-010-00-049	KEY	1
11	10-010-00-412-R1	PLANETARY GEAR MOTOR	1
12	10-010-00-CHAIN	ROLLER CHAIN #35-SS	1
13	10-010-30-040	SCREW, FEED	1
14	19-019-00	WASHER, HARDENED THRUST	1
15	6438K56	CLAMP-ON SHAFT COLLAR	1
16	90-056-10	PIN, 1/4 X 1.00 DOWEL	1
17	90145A539	1/4 x 5/8 LG. DOWEL PIN	2
18	91847A029	JAM NUT 1/4"-20, SS	1
19	92185A249	SHCS #10-24 x 1.25" LG	4
20	92240A581	HHCS 5/16"-18 x 3/4" LG	4
21	92240A585	HHCS 5/16"-18 x 1.25" LG	1
22	92311A534	CUP POINT SET SCREW 1/4"-20 x 5/16" LG	2
23	92311A541	SET SCREW 1/4"-20 x 7/8" LG, SS	1
24	92320A231	STANDOFF	4
25	9389A580	CLEVIS PIN	1
26	9713K94	DISC, CLUTCH	4
27	98017A689	5/16" WASHER, SS	4
28	P06-052-160	YOKE	1
29	P06-052-161	BUSHING, FEED CLUTCH	1
30	P06-052-181	SPROCKET FOR #35 CHAIN, 20T,3/8 PITCH	1
31	P06-052-182	SPROCKET FOR #35 CHAIN, 15T, 3/8 PITCH	1
32	1293K21	1/4-28 GREASE FITTING; SS	3

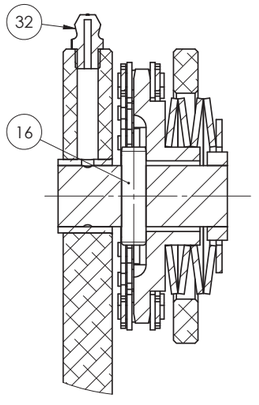




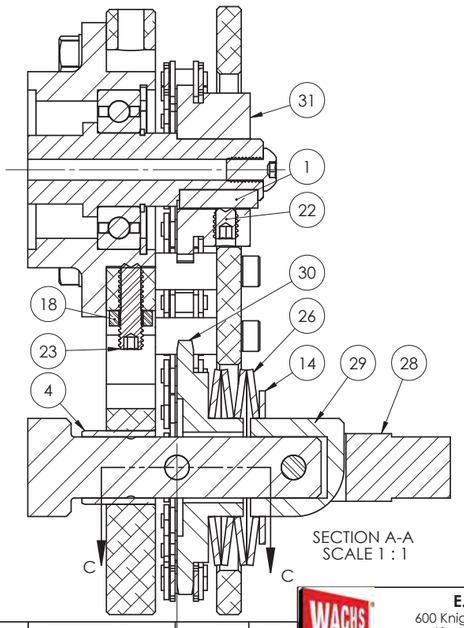
SECTION B-B
SCALE 1 : 1



SECTION D-D
SCALE 1 : 1



SECTION C-C
SCALE 1 : 1



SECTION A-A
SCALE 1 : 1

REV.	DESCRIPTION	DATE	APR.
1	PRODUCTION RELEASE	11/17/2009	KRP

REVISION HISTORY

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TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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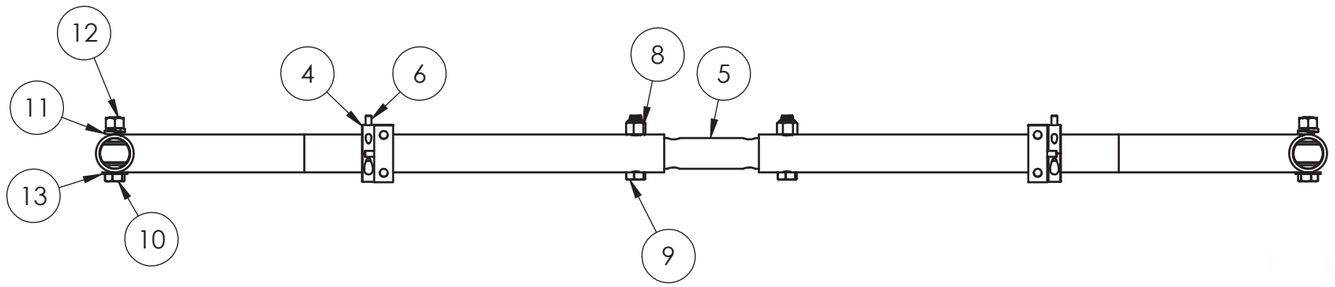
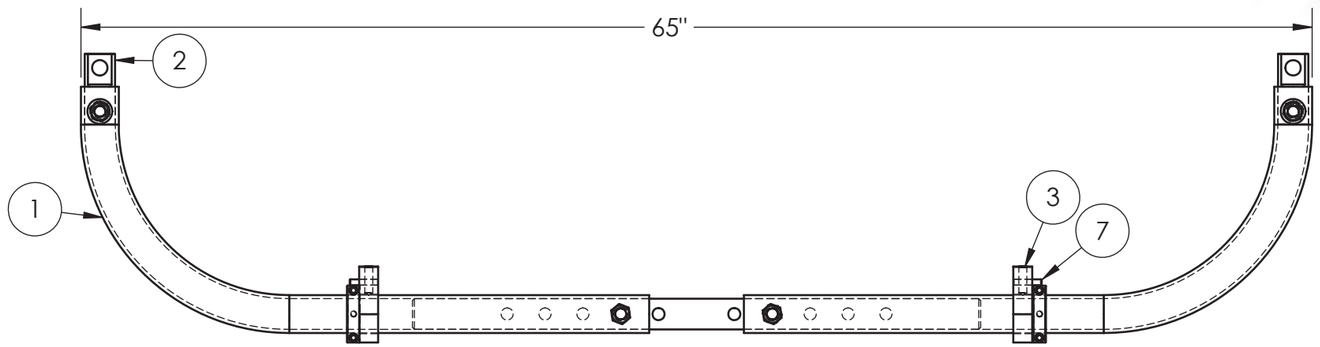
E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE	FRAME FEED		
DRAWN BY	AG	APPROVED BY	.
SCALE	1:2		
DATE	10/26/09	DATE	.
SHEET	1 OF 1		
SIZE	C	DWG. NO.	10-010-30-411-R1
REV.	1		

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-30-250	TUBE, LIFTING	2
2	10-010-00-252-R1	LIFTING PLUG	2
3	10-010-00-253	PLATE, 253	2
4	10-010-00-254	COLLAR	2
5	10-010-36-255	BAR, LIFTING	1
6	90145A583	5/16 X 1"LG DOWEL PIN	2
7	90145A587	5/16 X 1-1/2"LG DOWEL PIN	2
8	91831A144	LOCKNUT 5/8"-11,SS	2
9	92198A806	HHCS 5/8"-11x3" LG, SS	2
10	91286A410	Gr 8 Coated Alloy HHCS 5/8"-11	2
11	92147A035	Galv Lock Washer 5/8" 1.08" OD,	2
12	93827A253	Ult-Coat Gr 8l Hex Nut 5/8"-11	2
13	98180A160	Ult-Coat Gr 8 SAE Fl Wash 5/8"	2





REV.	DESCRIPTION	DATE	APR.
2	REVISED BOM	8/5/2010	JPW
1	PRODUCTION RELEASE	12/16/2009	KRP

REVISION HISTORY

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ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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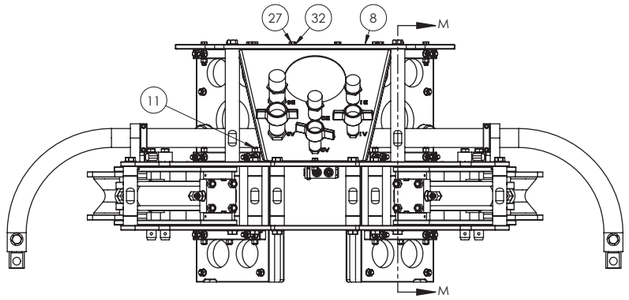
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

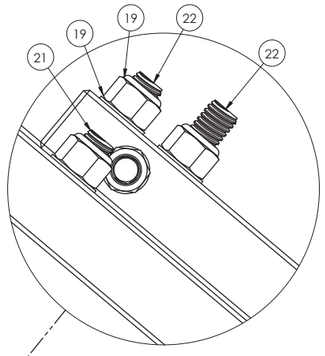
TITLE: LIFTING TUBE

DRAWN BY	APPROVED BY	SCALE
AG	.	1:8
DATE	DATE	SHEET
12/16/09	.	1 OF 1

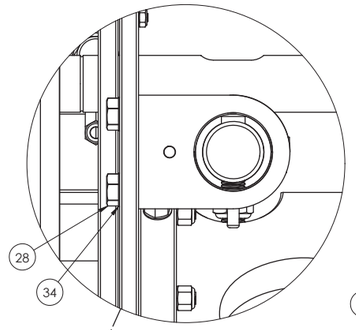
SIZE	DWG. NO.	REV.
B	**10-010-30-413-R1**	2

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-209-R1	ROD,209-R1	8
2	10-010-00-419B	Flow Divider Combiner Valve Assembly	1
3	10-010-30-203-R1	PLATE 203	1
4	10-010-30-203B-R1	PLATE, 203B	1
5	10-010-30-211-R1	BAR, 211	6
6	10-010-30-220-R1	PLATE, 220	2
7	10-010-30-221	SHOE, 221	4
8	10-010-30-222-R1	PLATE, 222	1
9	10-010-30-223	ROD, 223	2
10	10-010-30-224B	DESCRIPTION	1
11	10-010-30-413-R1	LIFTING TUBE	1
12	10-010-30-421-R1	ADJUSTABLE CLAMP WITH ACTUATOR	2
13	10-010-36-110-LH	CLAMP PIN FORK- LH	1
14	10-010-36-110-RH	CLAMP PIN FORK- RH	1
15	3609K2	ZINC ANODE	2
16	6432K29	SHAFT COLLAR	2
17	90101A230	NUT, NYLOCK JAM 1/4-20	2
18	91831A127	NUT, 3/8-16 SS NYLOCK	25
19	91831A133	HEX LOCKNUT 7/16"-14, SS	32
20	91831A137	LOCKNUT 1/2"-13, SS	2
21	92186A677	HHCS, 7/16-14 X 2" (316 SS)	8
22	92186A681	HHCS, 7/16-14 X 3" (316 SS)	24
23	92198A633	HHCS 3/8"-16 x 2.25" LG, SS	6
24	92198A752	HHCS, 1/2"-13 X 3-1/4" LNG., SS	2
25	92210A632	FHCS 3/8"-16 x 2" LG	12
26	92240A583	HHCS 5/16"-18 x 1" lg	1
27	92240A626	HHCS 3/8"-16x1.5"LG, SS	7
28	92240A714	HHCS 1/2"-13 x 1.25" LG	4
29	92240A798	HHCS 5/8"-11 x 1.5"LG, SS	14
30	92949A550	BHCS, 1/4-20 x 2" LNG.	2
31	95412A804	5/8-11 x 1.5" LG. STUD	2
32	98017A199	3/8" WASHER, SS	38
33	98017A204	7/16 WASHER,SS	64
34	98017A209	1/2 WASHER, SS	8
35	98017A215	5/8 WASHER, SS	14
36	98017A655	1/4" WASHER, SS	2
37	98017A689	5/16" WASHER, SS	1
38	PARKER 6105-08	QUICK CONNECT, 1/2" MALE	2
39	PARKER 6105-16	QUICK CONNECT, 1" MALE	1
40	PARKER 6125-08	QUICK CONNECT, 1/2" FEMALE	2
41	PARKER 6125-16	QUICK CONNECT, 1" FEMALE	1

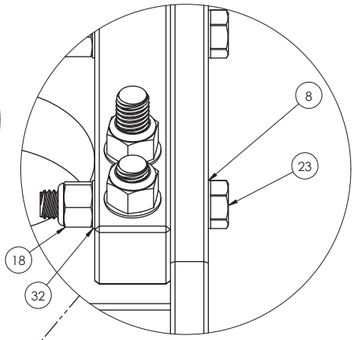




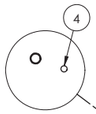
DETAIL F
SCALE 1 : 1



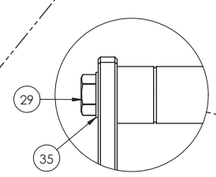
DETAIL D
SCALE 1 : 2



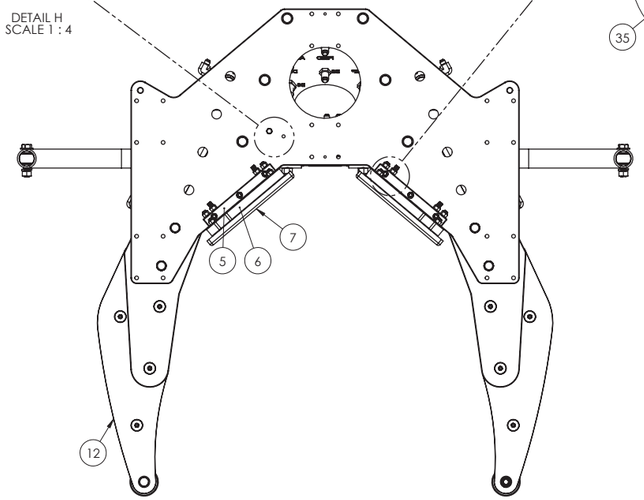
DETAIL E
SCALE 1 : 1

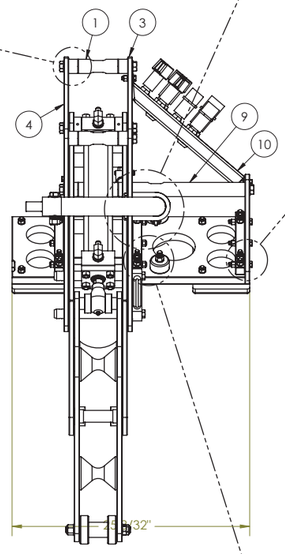


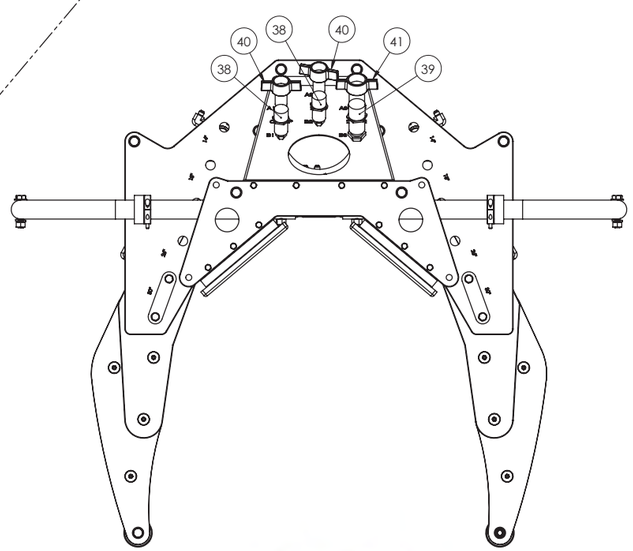
DETAIL H
SCALE 1 : 4

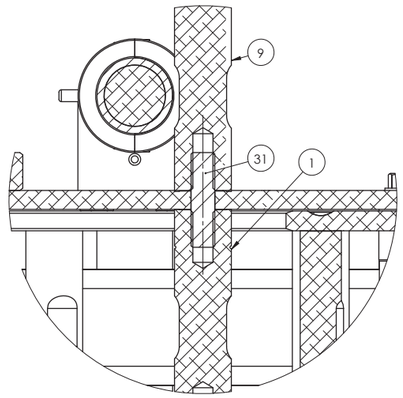


DETAIL L
SCALE 1 : 2

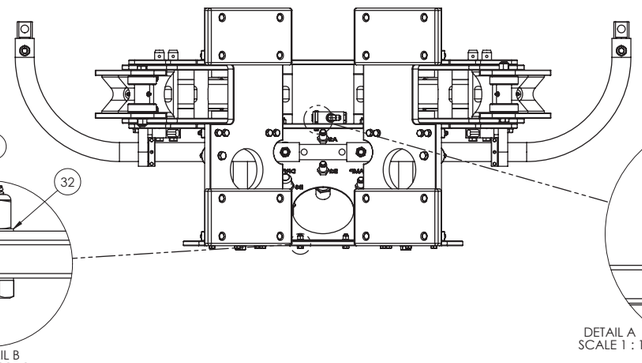


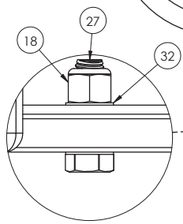




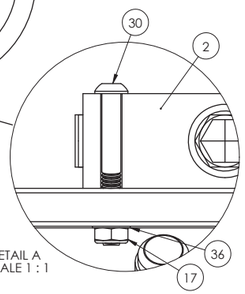


SECTION M-M
SCALE 1 : 2

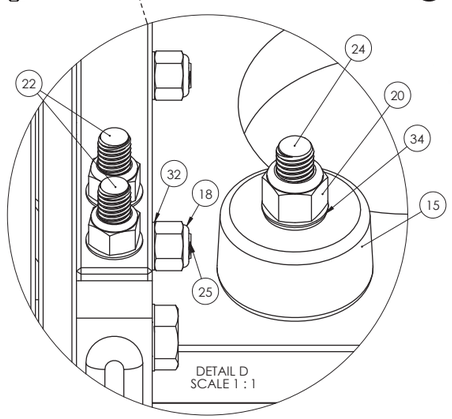




DETAIL B
SCALE 1 : 1



DETAIL A
SCALE 1 : 1



DETAIL D
SCALE 1 : 1

REV.	DESCRIPTION	DATE	APR.
3	UPDATE TO R-1	1/16/2015	Karl K.
2	REVISED BOM	8/5/2010	JPW
1	PRODUCTION RELEASE	11/20/2009	KRP

REVISION HISTORY

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE IN INCHES.
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DO NOT SCALE DRAWING.

TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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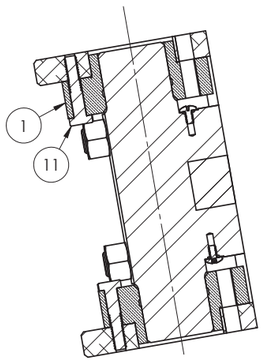
E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: CLAMP, 30"-12" PIPE RANGE

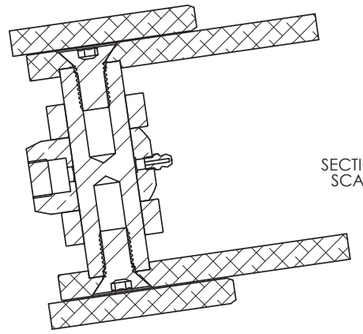
DRAWN BY	APPROVED BY	SCALE
AG	.	1:8
DATE: 11/20/09	DATE: .	SHEET: 1 OF 1

SIZE: D | DWG. NO: 10-010-30-420-R1 | REV: 3

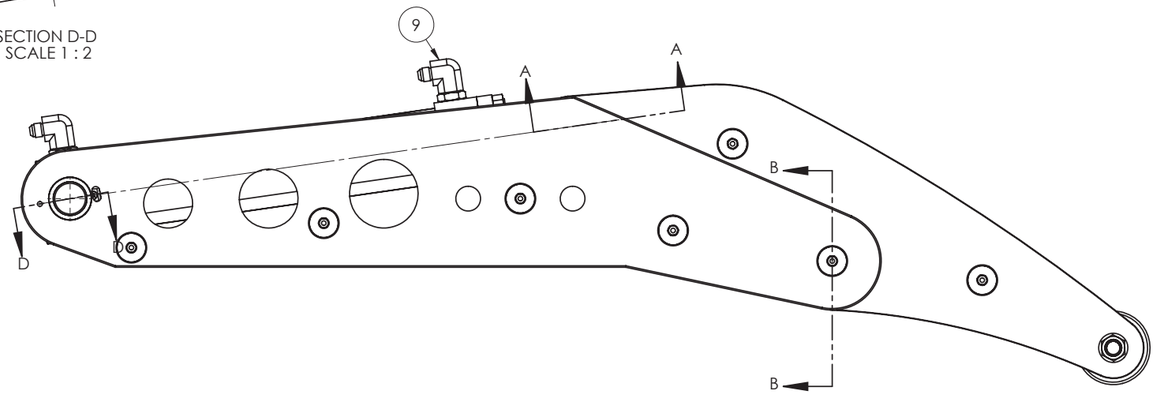
ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	10-010-00-205-R1	BUSHING, CYLINDER	2
2	10-010-00-207	ROD,207	1
3	10-010-00-213	SPACER, 213	1
4	10-010-00-215	ROD, 215	3
5	10-010-30-202-R1	PLATE, 202	1
6	10-010-30-202B-R1	PLATE, 202B	1
7	10-010-30-422-R1	CLAMP ARM, 30"	1
8	10-010-30-248	HYDRAULIC CYLINDER	1
9	Parker 6-10_c5OX-S	ORB-JIC ELBOW	2
10	92210A796	FHCS 5/8"-11x 1.25" LG.	10
11	92198A544	HHCS 1/4"-20 x 1.25" LG	2

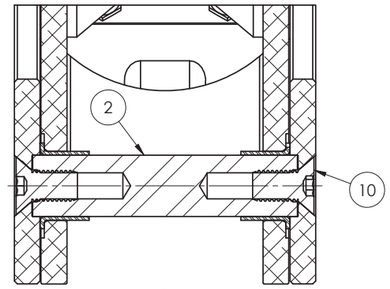


SECTION D-D
SCALE 1 : 2

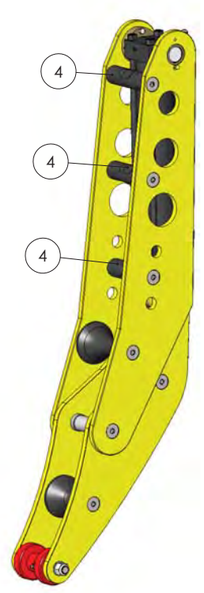


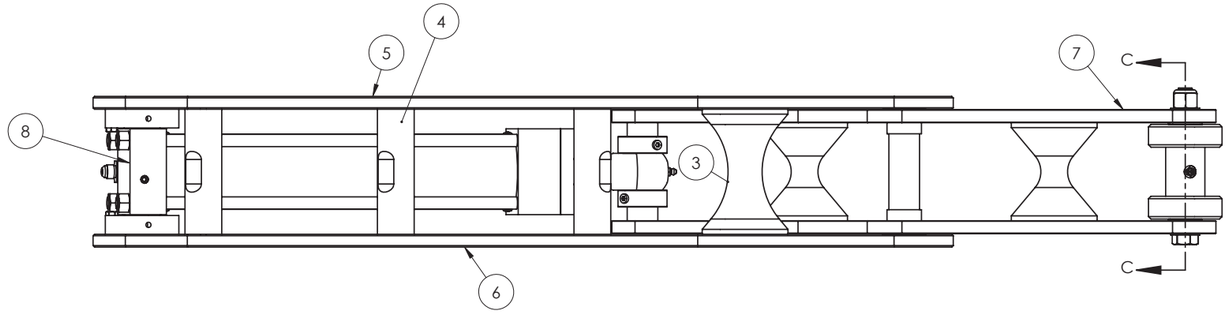
SECTION A-A
SCALE 1 : 2

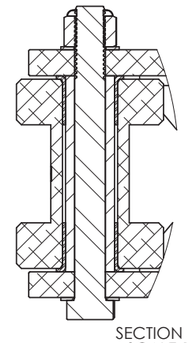




SECTION B-B
SCALE 1 : 2







SECTION C-C
SCALE 1 : 2

REV.	DESCRIPTION	DATE	APR.
2	UPDATE TO -R1	1/19/2015	Karl K
1	PRODUCTION RELEASE	11/19/2009	KRP

REVISION HISTORY

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DO NOT SCALE DRAWING.

TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±1.5 MIN.

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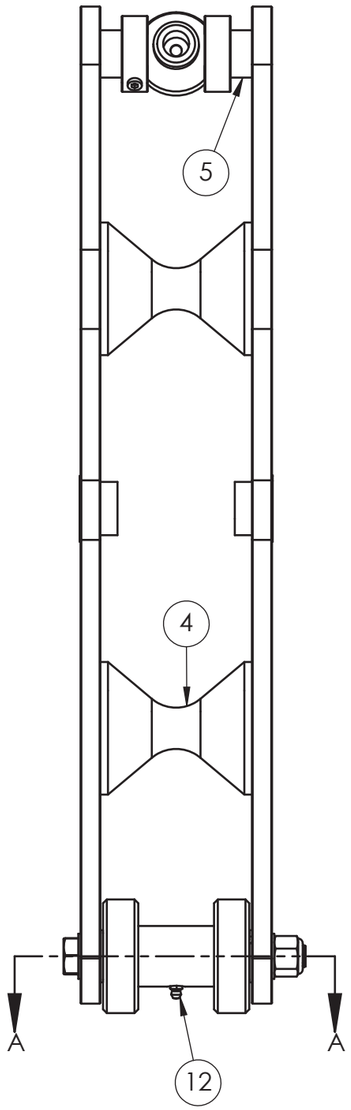
E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

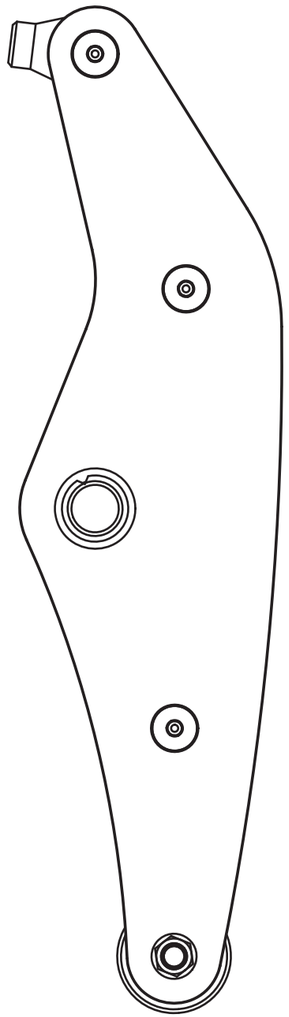
TITLE: ADJUSTABLE CLAMP WITH ACTUATOR

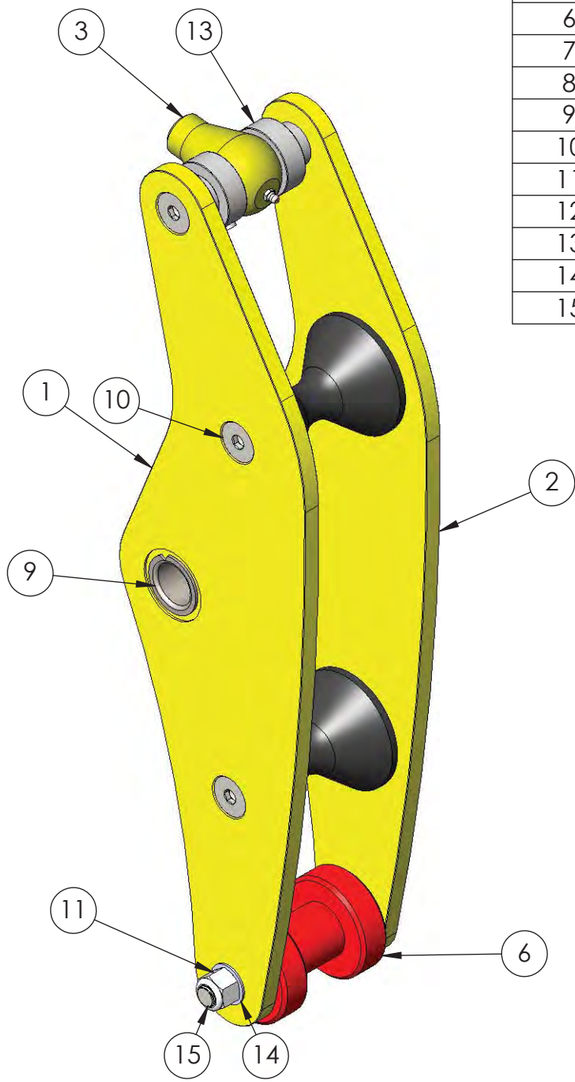
DRAWN BY	APPROVED BY	SCALE
AG	.	1:4
DATE	DATE	SHEET
11/19/09	.	1 OF 1

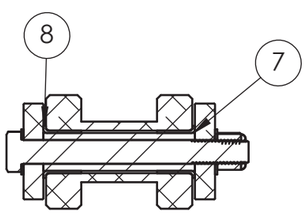
SIZE	DWG. NO.	REV.
C	10-010-30-421-R1	2

NOTES:
1. MATERIAL: PART INFO IN ASSY BOM
2. FINISH: PART INFO IN ASSY BOM









SECTION A-A

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-30-201-R1	PLATE, 201	1
2	10-010-30-201B-R1	PLATE, 201B	1
3	10-010-00-204	ROD END, CYLINDER	1
4	10-010-00-212	SPACER, 212	2
5	10-010-00-206	ROD, 206	1
6	10-010-00-208	ROLLER	1
7	10-010-00-210	TUBE, 210	1
8	Garlock 16FDU16	BUSHING	2
9	Garlock 20FDU16	BUSHING	2
10	92210A796	FHCS 5/8"-11x 1.25" LG.	6
11	90715A185	LOCKNUT 5/8"-11,SS	1
12	1293K21	1/4-28 GREASE FITTING; SS	2
13	6462K29	SHAFT COLLAR	2
14	98017A215	5/8 WASHER, SS	2
15	92186A818	5/8-11 X 6 LG HHCS 316SS	1

REV.	DESCRIPTION	DATE	APR.
2	UPDATE TO -R1	1/19/2015	Karl K
1	RELEASED FOR PRODUCTION	10/6/2014	Karl K

REVISION HISTORY

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TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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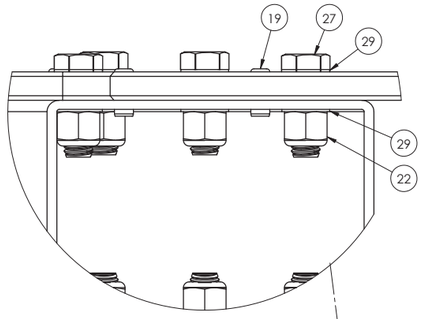
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

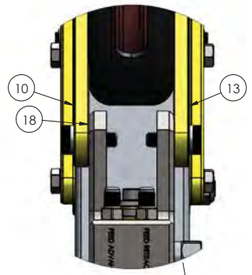
TITLE: CLAMP ARM, 30"

DRAWN BY	APPROVED BY	SCALE
MWG	KRP	1:4
DATE: 5-28-08	DATE: 5-28-08	SHEET: 1 OF 1

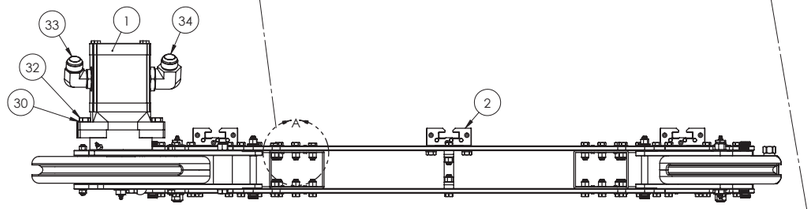
SIZE	DWG. NO.	REV.
B	**10-010-30-422-R1**	2

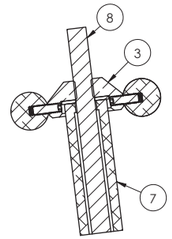


DETAIL A
SCALE 1 : 1



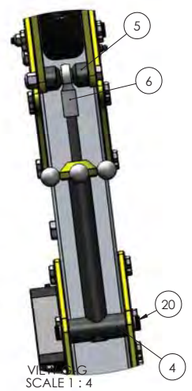
DETAIL B
SCALE 1 : 2



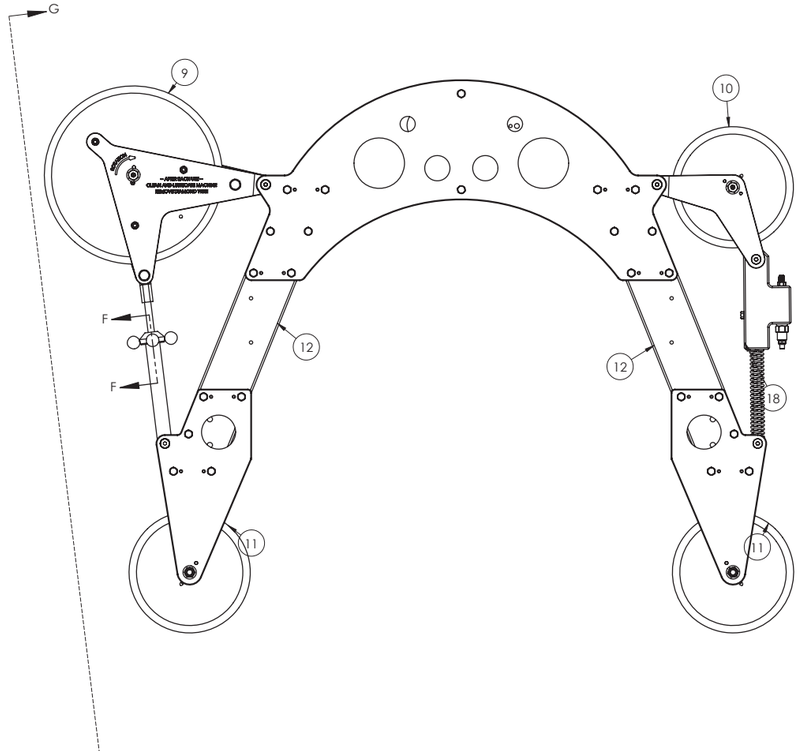


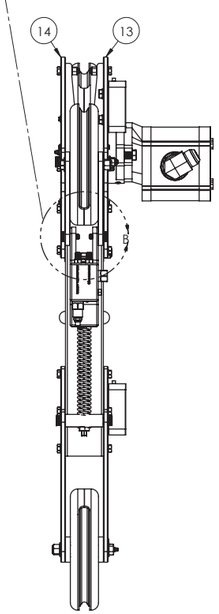
SECTION F-F
SCALE 1 : 2

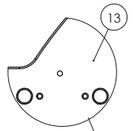
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-001	HYDRAULIC MOTOR	1
2	10-010-00-003	LINEAR BEARING	3
3	10-010-00-010	TENSION KNOB	1
4	10-010-00-023	ROD, 023	1
5	10-010-00-024	SPACER, 024	2
6	10-010-00-062	BALL JOINT ROD END	1
7	10-010-00-260	ROD, 260	1
8	10-010-00-261	ROD, 261	1
9	10-010-00-431C-R1	FRAME DRIVE ARM	1
10	10-010-00-433B-R1	ASSY, TENSIONING WHEEL	1
11	10-010-00-434B-R1	ASSY, IDLER WHEEL	2
12	10-010-30-022	SQUARE TUBING	2
13	10-010-30-030-R1	PLATE, 030	1
14	10-010-30-030B-R1	PLATE, 030B	1
15	10-010-30-031-R1	PLATE, 031	2
16	10-010-30-031B-R1	PLATE, 031B	2
17	10-010-36-034	PLATE, 034	1
18	H10-071-200	DWS FEED CONTROL UNIT	1
19	90145A539	1/4 x 5/8 LG. DOWEL PIN	36
20	90298A712	SHOULDER SCREW 3/8"-16 x 1" LG, SS	2
21	91287A375	HHCS M10 x 1.5, 45mm LG, SS	12
22	91831A127	NUT, 3/8-16 SS NYLOCK	47
23	91831A137	LOCKNUT 1/2"-13, SS	1
24	92198A628	HHCS 3/8"-16x1.5"LG, SS	2
25	92198A641	HHCS 3/8"-16x4.25"LG, SS	1
26	92198A753	HHCS 1/2"-13x3.75" LG, SS	1
27	92240A625	HHCS 3/8"-16x 1-1/8"LG, SS	44
28	93475A280	WASHER 10mm, SS	12
29	98017A199	3/8" WASHER, SS	94
30	98017A209	1/2 WASHER, SS	4
31	1860A032	WASHER 1/2", PH 17-4	1
32	92240A714	HHCS 1/2"-13 x 1.25" LG	2
33	Parker 16_C5OX-SS	ORB TO JIC ELBOW	1
34	Parker 16-20_C5OX-SS	ORB TO JIC ELBOW	1
35	Garlock 08FDU06	BUSHING	4



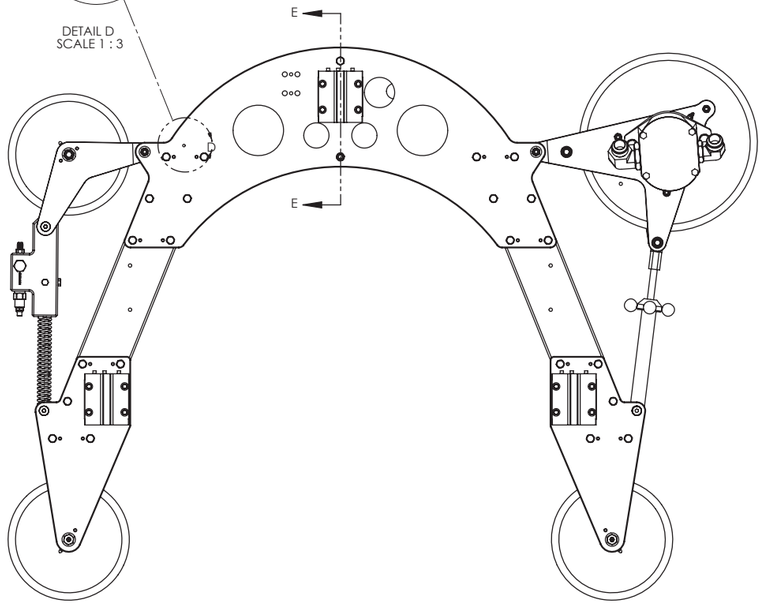
VIEW G
SCALE 1 : 4

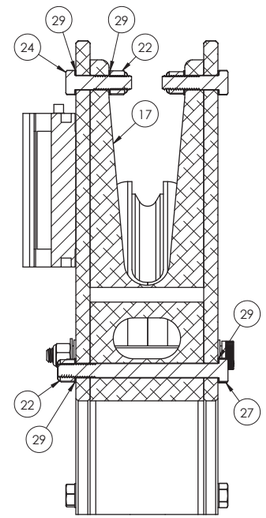






DETAIL D
SCALE 1 : 3





REV.	DESCRIPTION	DATE	APR.
2	UPDATE TO R-1	1/16/2015	Karl K
1	PRODUCTION RELEASE	11/20/2009	KRP

REVISION HISTORY

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FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
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THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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Section Bridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

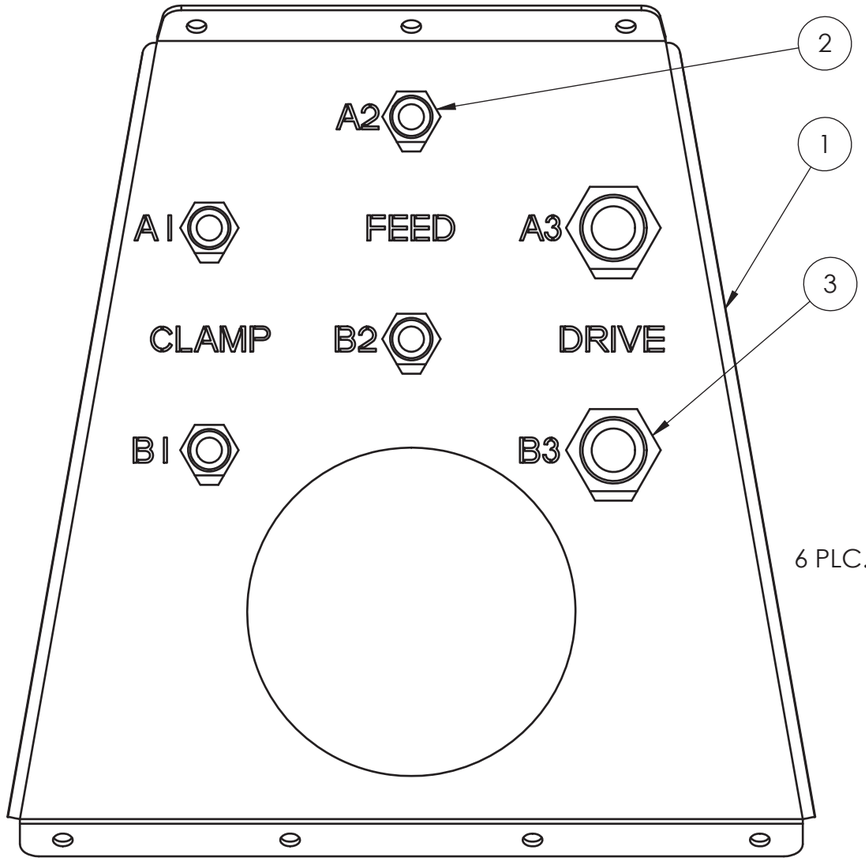
TITLE			
FRAME BOW			
DRAWN BY: AG	APPROVED BY: .	SCALE: 1:8	
DATE: 11/20/09	DATE: .	SHEET: 1 OF 1	
SIZE: D	DWG. NO: 10-010-30-430-R1	REV: 2	

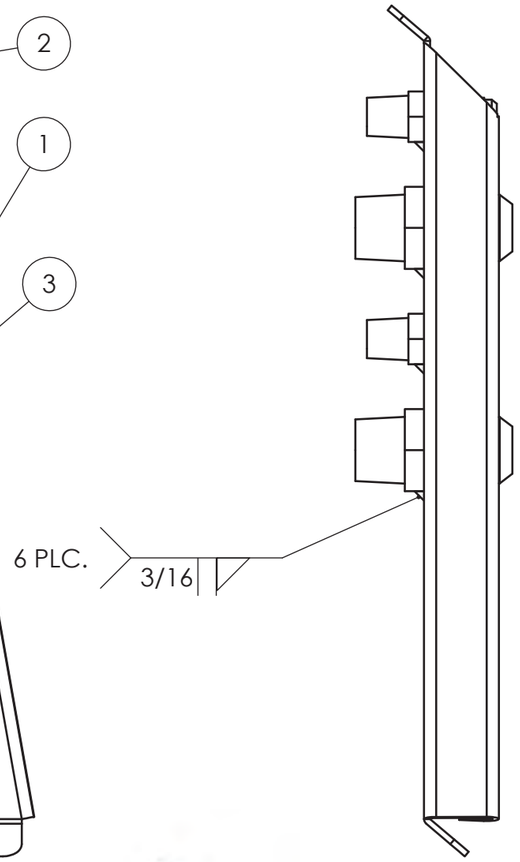
SECTION G-G
SCALE 1 : 4

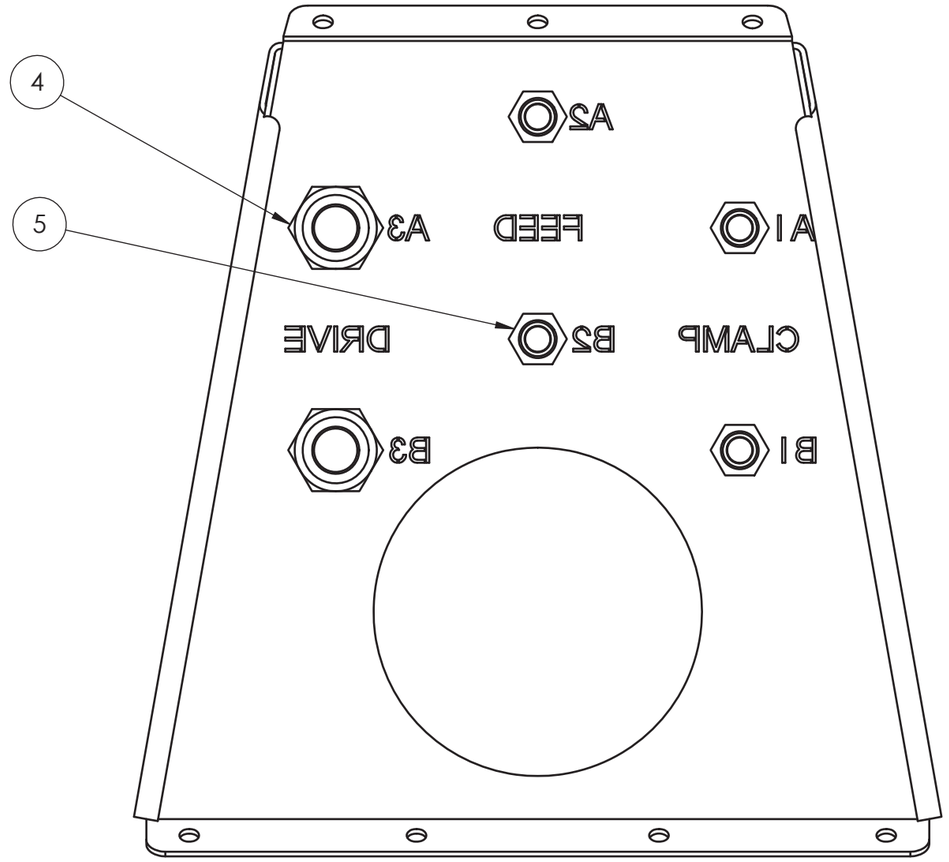
ASSEMBLY NOTE:

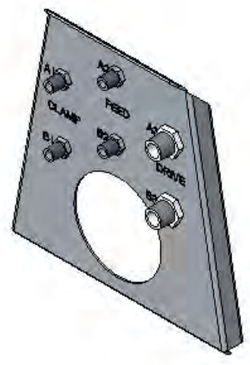
ALIGN BULKHEAD FITTINGS AS SHOWN, AND TIGHTLY FASTEN BEFORE WELDING

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-30-224	PLATE, BULKHEAD	1
2	Brennan 2706-08-08	MP-MJ BULKHEAD STRAIGHT	4
3	Brennan 2706-16-16	MP-MJ BULKHEAD STRAIGHT	2
4	Brennan 0306-16	NUT, BULKHEAD	2
5	Brennan 0306-08	NUT, BULKHEAD	4









REV.	DESCRIPTION	DATE	APR.
1	PRODUCTION RELEASE	12/7/09	AG

REVISION HISTORY

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FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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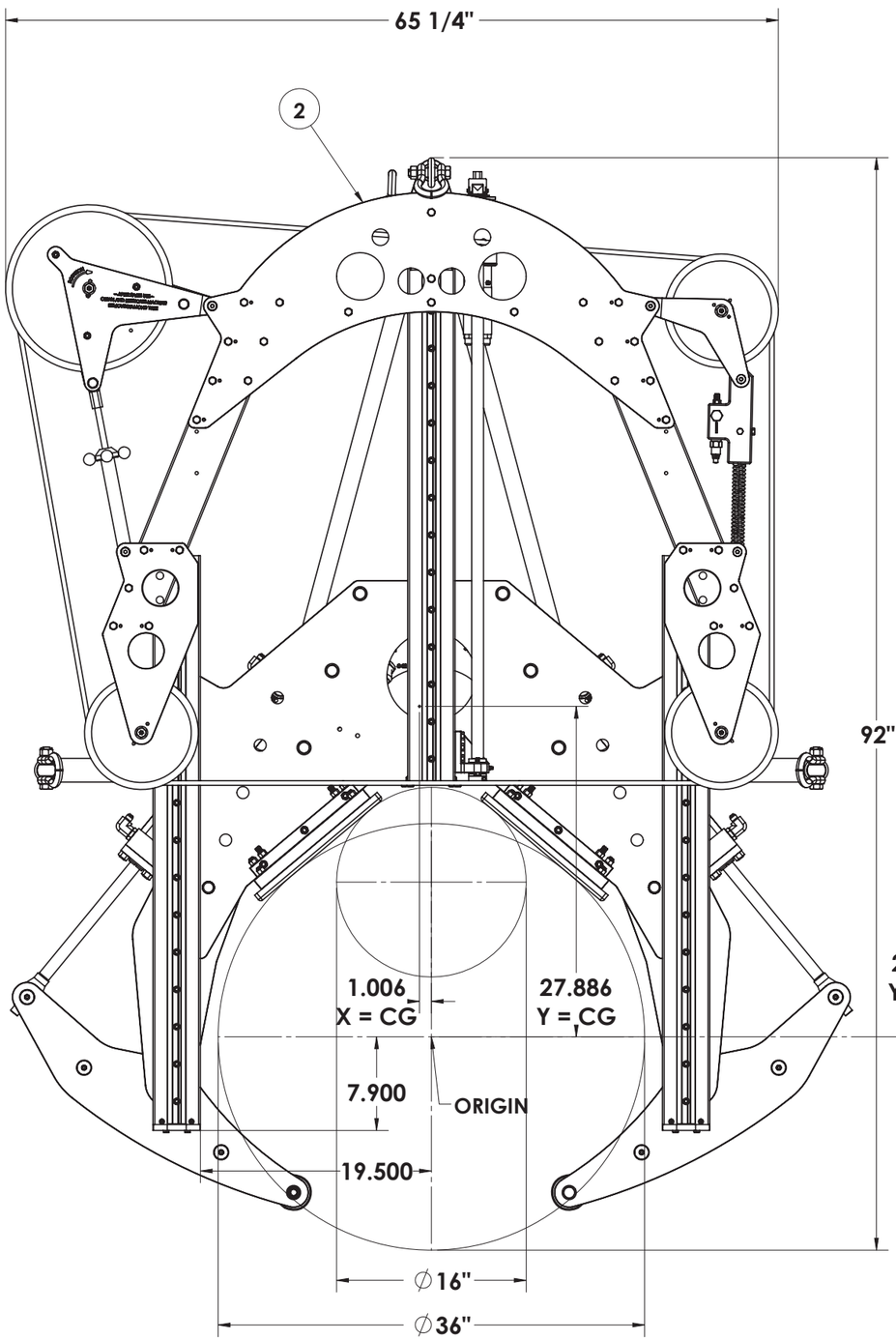
E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

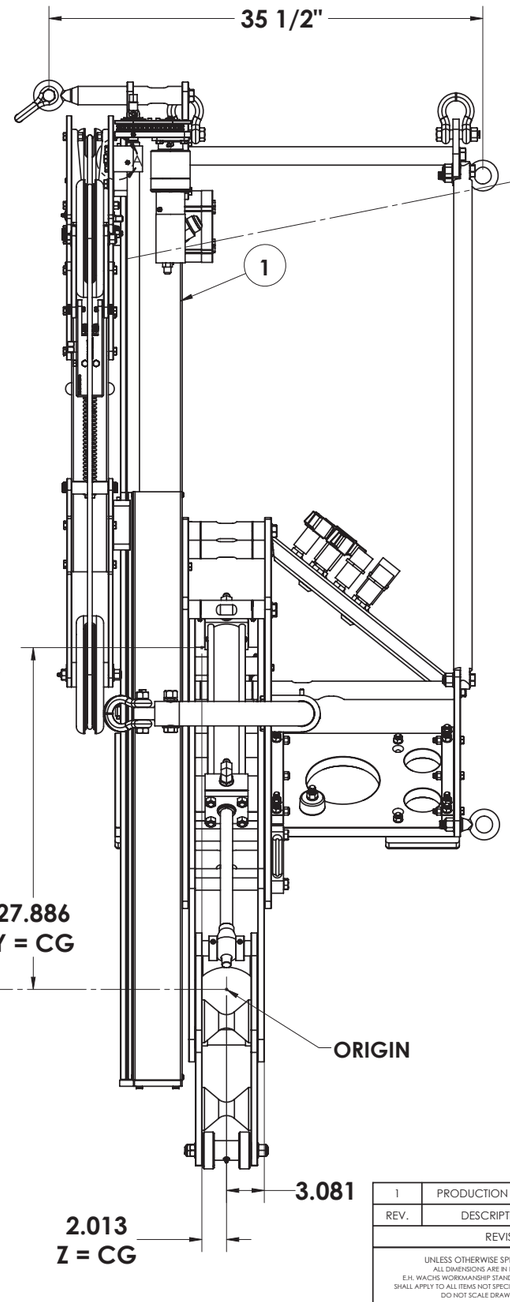
TITLE: WELDMENT, BULKHEAD PLATE

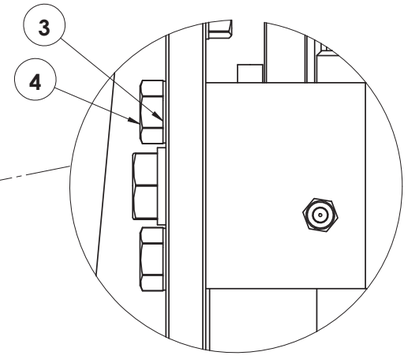
DRAWN BY	APPROVED BY	SCALE
MWG	KRP	1:3
DATE: 4-31-09	DATE: 4-31-09	SHEET: 1 OF 1

SIZE	DWG. NO.	REV.
B	**10-010-30-224B**	1

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-36-410-R1	FRAME ASSEMBLY	1
2	10-010-36-430-R1	WS-3616 BOW	1
3	98017A199	3/8" WASHER, SS	4
4	92240A623	HHCS 3/8"-16x7/8" LG,SS	4







DETAIL A
SCALE 1 : 1

REV.	DESCRIPTION	DATE	APR.
1	PRODUCTION RELEASE	3/21/2011	KarlK

REVISION HISTORY

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE IN INCHES.
E.H. WACHS WORKMANSHIP STANDARDS (WI 17-01) SHALL APPLY TO ALL ITEMS NOT SPECIFIED ON DRAWING.
DO NOT SCALE DRAWING.

TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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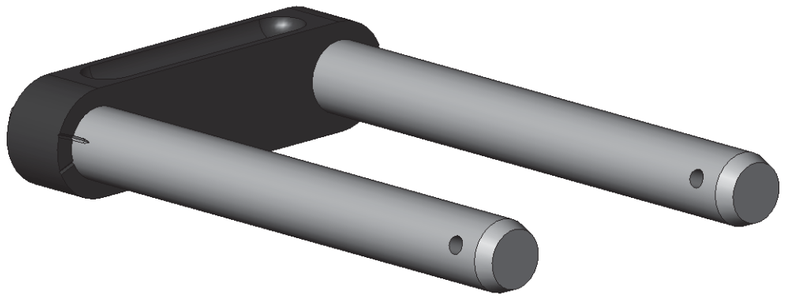
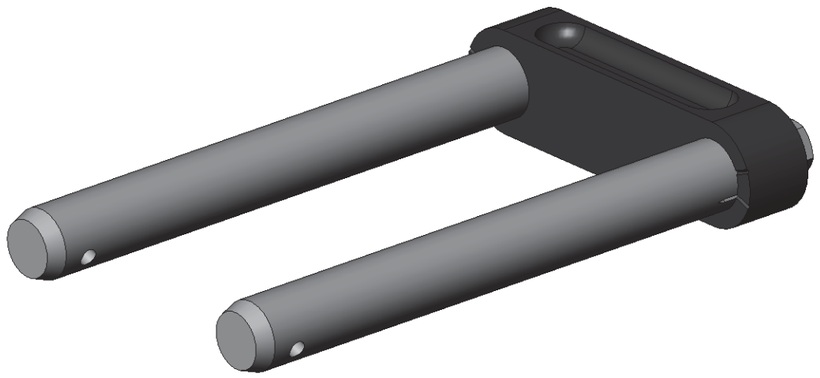
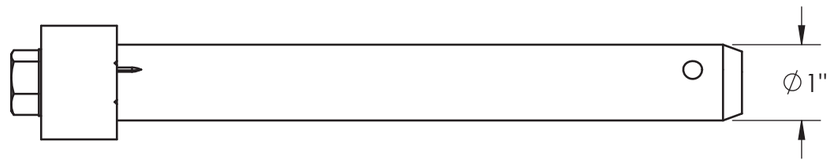
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

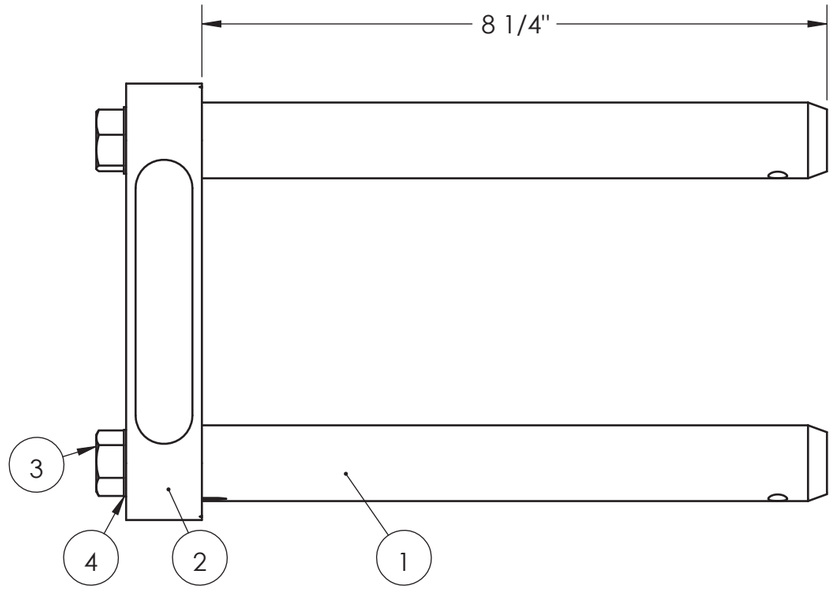
TITLE			
WS3616 GENERAL ARRANGEMENT			
DRAWN BY: AG	APPROVED BY: KRP	SCALE: 1:8	
DATE: 11/4/2009	DATE: 11/4/2009	SHEET: 1 OF 1	
SIZE: C	DWG. NO.: 10-010-536-R1	REV.: 1	

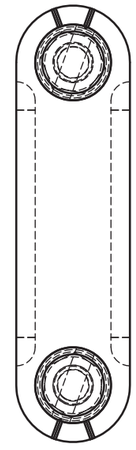
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-230	ROD, 230	2
2	10-010-00-231	BLOCK, 231	1
3	92240A713	HHCS 1/2-13 x 1.125" LG, SS	2
4	98017A209	1/2 WASHER, SS	2











REV.	DESCRIPTION	DATE	APR.
1	RELEASED FOR PRODUCTION	4/21/2014	Karl K

REVISION HISTORY

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DO NOT SCALE DRAWING.

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ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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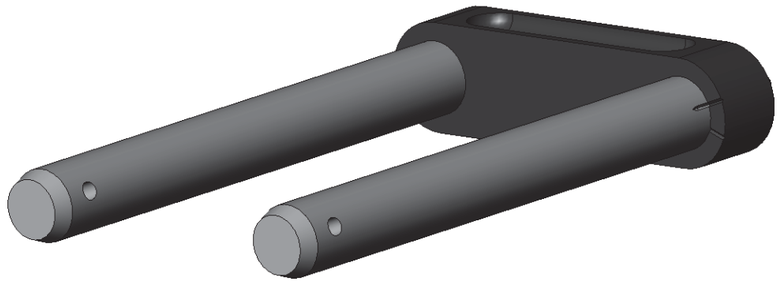
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

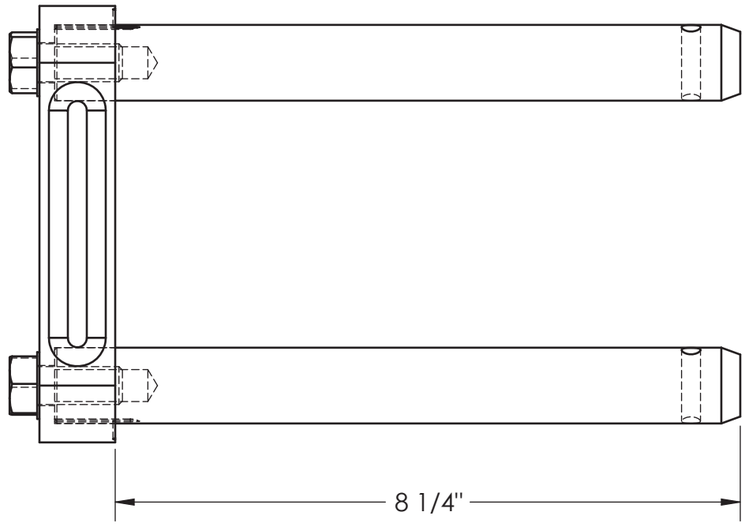
TITLE: CLAMP PIN FORK- LH

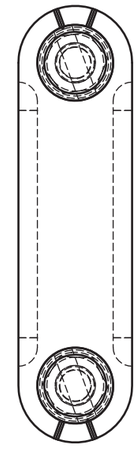
DRAWN BY	APPROVED BY	SCALE
AG		1:2
DATE	DATE	SHEET
11/02/09		1 OF 1

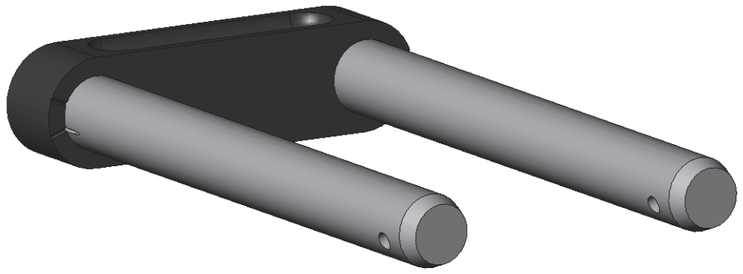
SIZE	DWG. NO.	REV.
B	**10-010-36-110-LH**	1

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-230	ROD, 230	2
2	10-010-00-231	BLOCK, 231	1
3	92240A713	HHCS 1/2-13 x 1.125" LG, SS	2
4	98017A209	1/2 WASHER, SS	2









REV.	DESCRIPTION	DATE	APR.
1	RELEASED FOR PRODUCTION	4/21/2014	Karl K

REVISION HISTORY

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TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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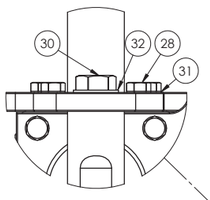
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: CLAMP PIN FORK- RH

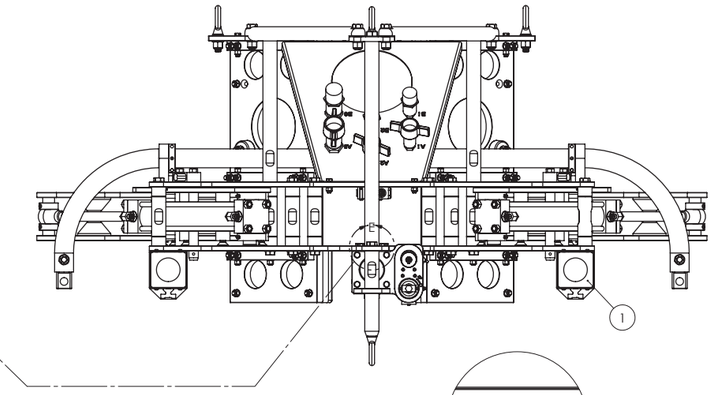
DRAWN BY	APPROVED BY	SCALE
AG	.	1:2
DATE: 11/02/09	DATE: .	SHEET: 1 OF 1

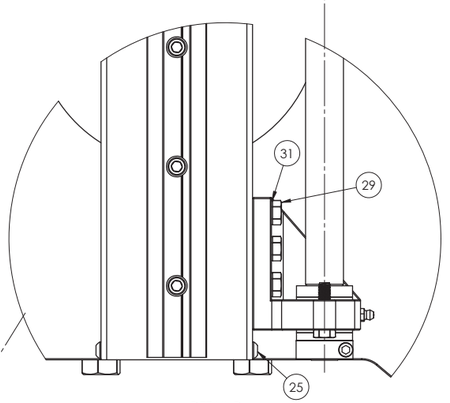
SIZE	DWG. NO.	REV.
B	**10-010-36-110-RH**	1

ITEM NO.	PART NUMBER	DESCRIPTION	36" Position/ QTY.
1	10-010-00-027	PLATE, 027	3
2	10-010-00-027B	PLATE, 027B	2
3	10-010-00-028	PLATE, 028	1
4	10-010-00-029	PLATE, 029	2
5	10-010-00-251	ROD, 251	1
6	10-010-00-243-R1	PLATE, 243-R1	1
7	10-010-00-246-R1	PLATE, 246-R1	1
8	10-010-00-246B-R1	PLATE, 246B-R1	1
9	10-010-36-001	LINEAR GUIDE RAIL	3
10	10-010-36-020	TUBE, LINEAR GUIDE MOUNTING	2
11	10-010-36-021	TUBE, LINEAR GUIDE MOUNTING	1
12	10-010-36-023	TAPPED RAIL	3
13	10-010-36-242	ROD, 242	1
14	10-010-36-247	BAR, LIFTING	2
15	10-010-36-411-R1	FRAME FEED	1
16	10-010-36-420-R1	CLAMP, 36"-16" PIPE RANGE	1
17	3014T867	EYEBOLT	4
18	90145A539	1/4 x 5/8 LG. DOWEL PIN	2
19	90715A185	LOCKNUT 5/8"-11,SS	7
20	91831A127	NUT, 3/8-16 SS NYLOCK	32
21	92196A539	SHCS 1/4"-20 x 5/8" LG, SS	4
22	92196A585	SHCS, 5/16-18 X 1-1/4, 18-8SS	45
23	92198A803	HHCS 5/8"-11 x 2.25" LG, SS	4
24	92210A626	FSHCS 3/8"-16x1.25"LG,SS	16
25	92949A537	BSHCS 1/4"-20x1/2"LG, SS	20
26	92240A546	HHCS 1/4"-20x1.5"LG, SS	8
27	92240A622	HHSC 3/8"-16 x 3/4" LG, SS	2
28	92240A625	HHCS 3/8"-16x 1-1/8"LG, SS	4
29	92240A626	HHCS 3/8"-16x1.5"LG, SS	18
30	92240A798	HHCS 5/8"-11 x 1.5"LG, SS	4
31	98017A199	3/8" WASHER, SS	57
32	98017A215	5/8 WASHER, SS	18
33	98017A220	3/4" WASHER, SS	2
34	98017A655	1/4" WASHER, SS	16
35	92240A839	HHCS 3/4"-10 x 1.5"LG, SS	2
36	91831A029	NYLOCK NUT, 1/4-20, 18-8SS	8

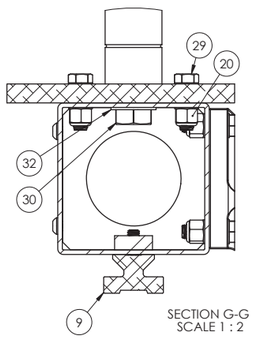


DETAIL E
SCALE 1 : 2

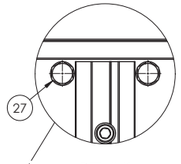




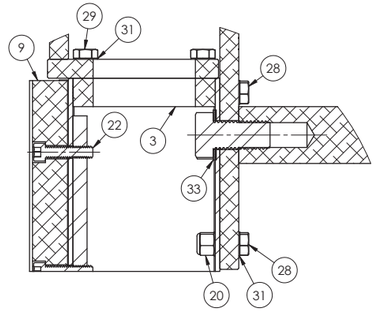
DETAIL D
SCALE 1 : 2



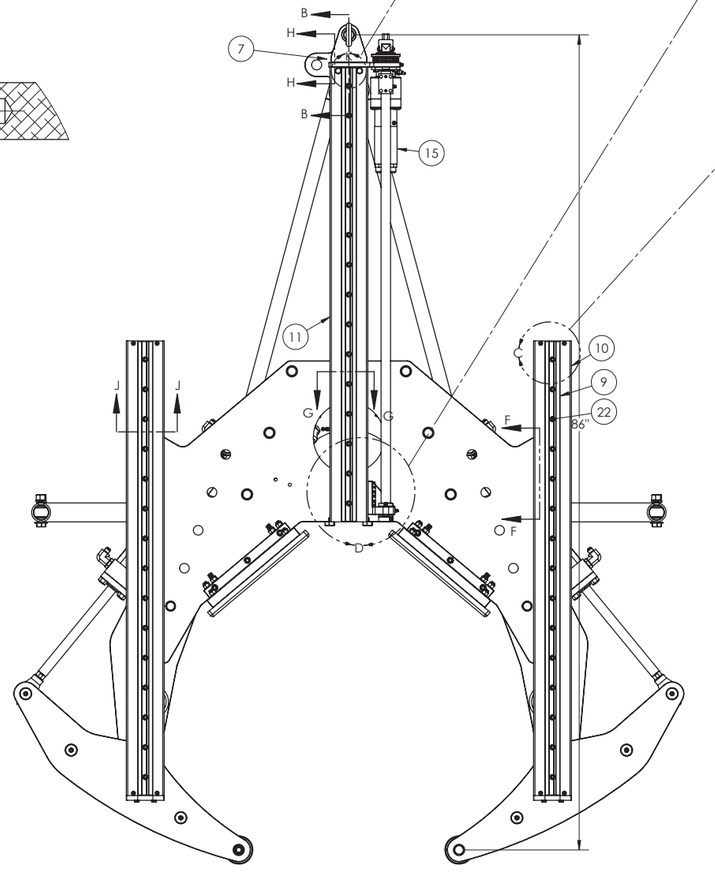
SECTION G-G
SCALE 1 : 2

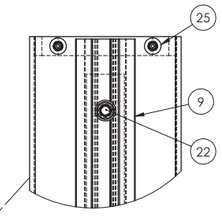


DETAIL K
SCALE 1 : 2

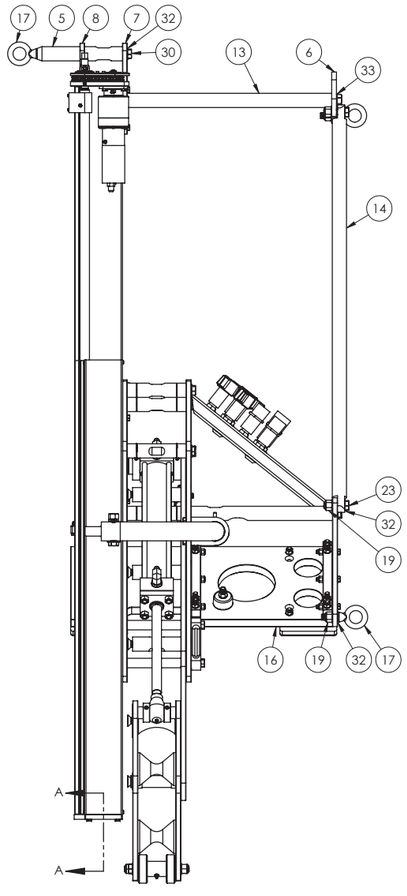


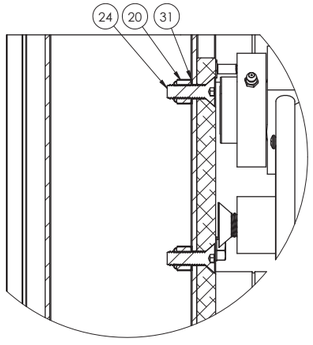
SECTION B-B
SCALE 1 : 2



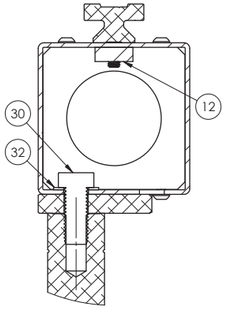


DETAIL C
SCALE 1 : 2

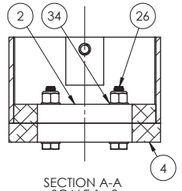




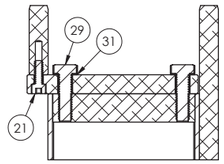
SECTION F-F
SCALE 1 : 2



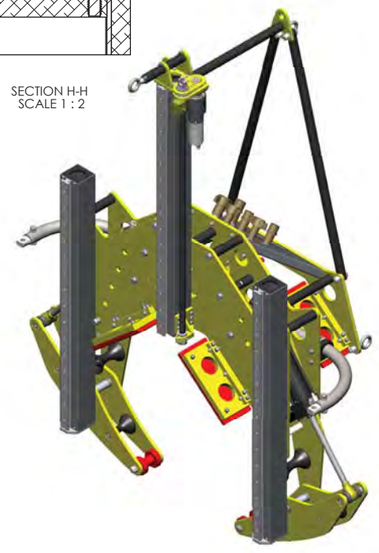
SECTION J-J
SCALE 1 : 2



SECTION A-A
SCALE 1 : 2



SECTION H-H
SCALE 1 : 2



REV.	DESCRIPTION	DATE	APR.
1	Released For Production	3/17/2011	KarlK

REVISION HISTORY

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ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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Lincolnshire, IL 60069
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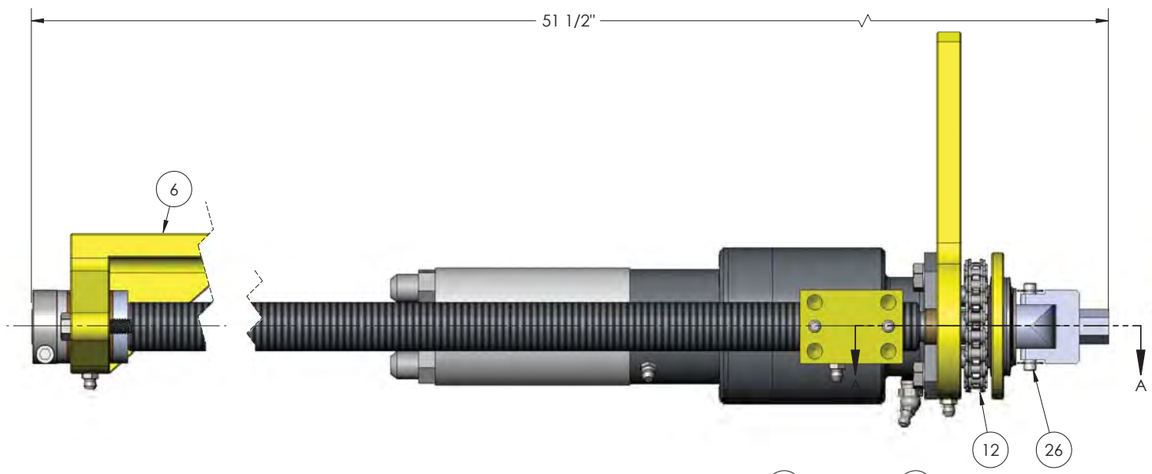
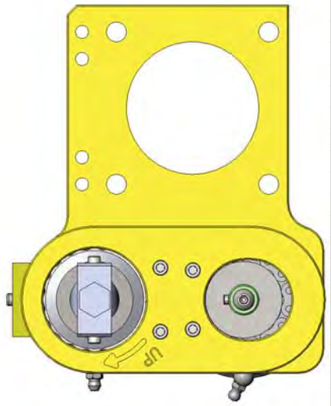
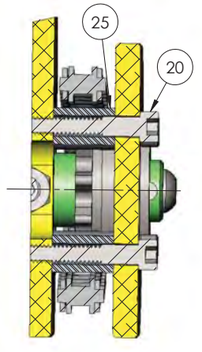
TITLE	FRAME ASSEMBLY		
DRAWN BY	APPROVED BY	SCALE	
AG	.	1:8	
DATE	DATE	SHEET	
10/27/09	.	1 OF 1	
SIZE	DWG. NO.	REV.	
D	10-010-36-410-R1	A	

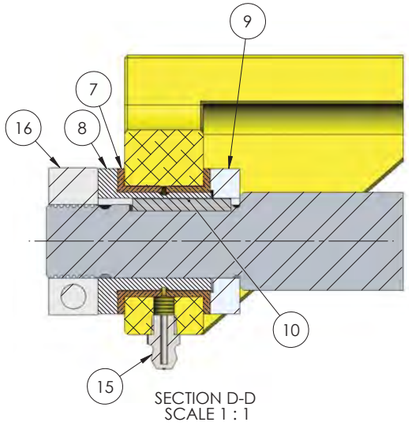




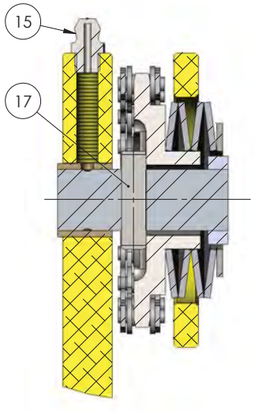
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-019	KEY	1
2	10-010-00-041-R1	PLATE, 041-R1	1
3	10-010-00-042-R1	PLATE, 042-R1	1
4	10-010-00-043	BUSHING, FEED	1
5	10-010-00-044	NUT, FEED	1
6	10-010-00-045-R1	BLOCK, FEED SCREW MOUNTING	1
7	10-010-00-046	BUSHING, FEED	2
8	10-010-00-047	RETAINER, FEED SCREW	1
9	10-010-00-048	WASHER, 048	1
10	10-010-00-049	KEY	1
11	10-010-00-412-R1	PLANETARY GEAR MOTOR	1
12	10-010-00-CHAIN	ROLLER CHAIN #35-SS	1
13	10-010-36-040	SCREW, FEED	1
14	10-010-19-019-00	TORRINGTON WASHER, TRB-1625	1
15	1293K21	1/4-28 GREASE FITTING; SS	3
16	6438K56	CLAMP-ON SHAFT COLLAR	1
17	98381A542	PIN, 1/4 X 1.00 DOWEL	1
18	90145A539	1/4 x 5/8 LG. DOWEL PIN	2
19	91847A029	JAM NUT 1/4"-20, SS	1
20	92185A249	SHCS #10-24 x 1.25" LG	4
21	92240A581	HHCS 5/16"-18 x 3/4" LG	4
22	92240A585	HHCS 5/16"-18 x 1.25" LG	2
23	92311A534	CUP POINT SET SCREW 1/4"-20 x 5/16" LG	1
24	92311A541	SET SCREW 1/4"-20 x 7/8" LG, SS	1
25	92320A231	STANDOFF	4
26	9389A580	CLEVIS PIN	1
27	9713K94	DISC, CLUTCH	4
28	98017A689	5/16" WASHER, SS	4
29	P06-052-160	YOKE	1
30	P06-052-161	BUSHING, FEED CLUTCH	1
31	P06-052-181B	SPROCKET, 2.40 PITCH x .375 PITCH	1
32	P06-052-182	SPROCKET FOR #35 CHAIN, 15T, 3/8 PITCH	1



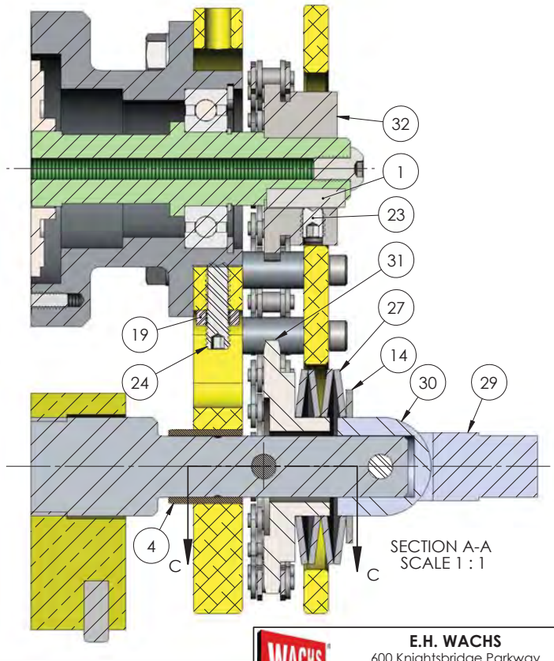
SECTION B-B
SCALE 1 : 1



SECTION D-D
SCALE 1 : 1



SECTION C-C
SCALE 1 : 1



SECTION A-A
SCALE 1 : 1

REV.	DESCRIPTION	DATE	APR.
1	PRODUCTION RELEASE	3/15/11	KarlK

REVISION HISTORY

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FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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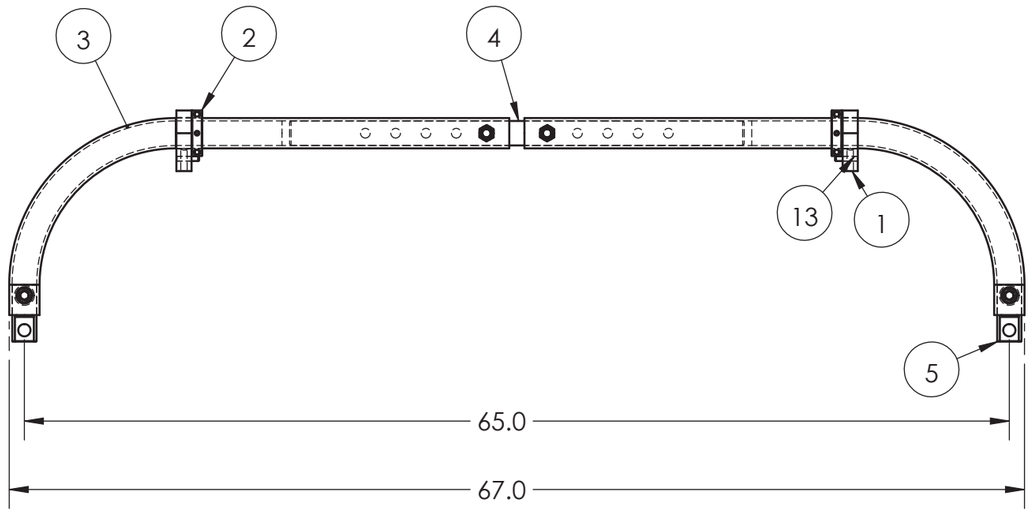
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

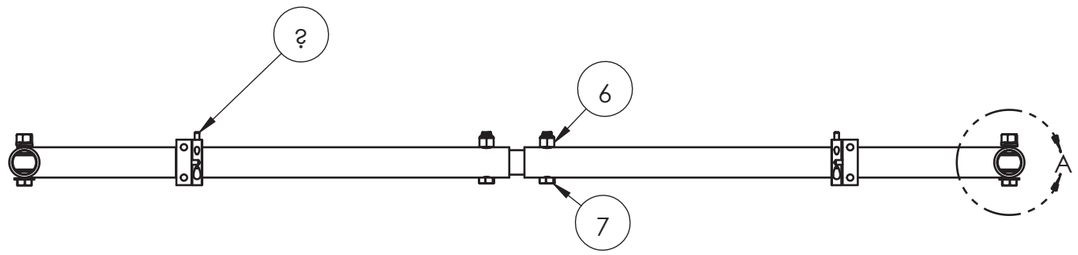
TITLE: FRAME FEED

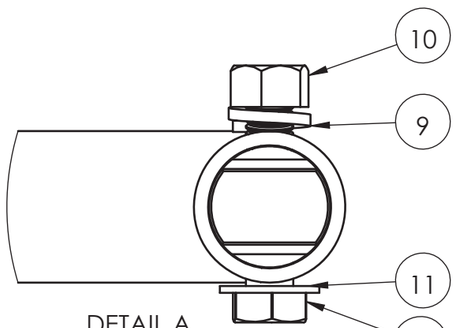
DRAWN BY	APPROVED BY	SCALE
AG	.	1:2
DATE	DATE	SHEET
10/26/09	.	1 OF 1

SIZE	DWG. NO.	REV.
C	10-010-36-411-R1	1

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-253	PLATE, 253	2
2	10-010-00-254	COLLAR	2
3	10-010-36-250	TUBE, LIFTING	2
4	10-010-36-255	BAR, LIFTING	1
5	10-010-00-252-R1	LIFTING PLUG	2
6	91831A144	LOCKNUT 5/8"-11,SS	2
7	92198A806	HHCS 5/8"-11x3" LG, SS	2
8	91286A410	Gr 8 Coated Alloy HHCS 5/8"-11	2
9	92147A035	Galv Lock Washer 5/8" 1.08" OD,	2
10	93827A253	Ult-Coat Gr 8l Hex Nut 5/8"-11	2
11	98180A160	Ult-Coat Gr 8 SAE Fl Wash 5/8"	2
12	90145A583	DOWEL PIN 5/16 x 1" LG, SS	2
13	90145A587	DOWEL PIN 5/16 x 1.5" LG	2







DETAIL A
SCALE 1 : 2

REV.	DESCRIPTION	DATE	APR.
2	REVISED BOM	8/5/2010	JPW
1	PRODUCTION RELEASE	12/1/2009	AG

REVISION HISTORY

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DO NOT SCALE DRAWING.

TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: LIFTING TUBE

DRAWN BY	APPROVED BY	SCALE
AG	.	1:10
DATE	DATE	SHEET
12/01/09	.	1 OF 1

SIZE	DWG. NO.	REV.
B	**10-010-36-413-R1**	2

ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	10-010-36-110-LH	CLAMP PIN FORK- LH	1
2	10-010-36-110-RH	CLAMP PIN FORK- RH	1
3	10-010-36-203-R1	PLATE,203-R1	1
4	10-010-36-203B-R1	PLATE, 203B-R1	1
5	10-010-36-211-R1	BAR, 211-R1	6
6	10-010-36-221	SHOE,221	4
7	10-010-36-222-R1	PLATE, 222-R1	1
8	10-010-36-223	ROD, 223	2
9	10-010-36-224B	BULKHEAD	1
10	10-010-36-220-R1	PLATE, 220-R1	2
11	10-010-00-419B	Flow Divider Combiner Valve Assembly	1
12	10-010-36-413-R1	LIFTING TUBE	1
13	10-010-00-209-R1	ROD,209-R1	9
14	10-010-36-421-R1	ADJUSTABLE CLAMP WITH ACTUATOR	2
15	3609K2	ZINC ANODE	2
16	90101A230	NUT, NYLOCK JAM 1/4-20	2
17	91831A127	NUT, 3/8-16 SS NYLOCK	25
18	91831A133	HEX LOCKNUT 7/16"-14, SS	32
19	91831A137	LOCKNUT 1/2"-13, SS	2
20	92186A677	HHCS, 7/16-14 X 2" (316 SS)	8
21	92186A681	HHCS, 7/16-14 X 3" (316 SS)	24
22	92198A633	HHCS 3/8"-16 x 2.25" LG, SS	6
23	92198A752	HHCS, 1/2"-13 X 3-1/4" LNG., SS	2
24	92210A632	FHCS 3/8"-16 x 2" LG	12
25	92240A626	HHCS 3/8"-16x1.5"LG, SS	7
26	92240A714	HHCS 1/2"-13 x 1.25" LG	4
27	92240A798	HHCS 5/8"-11 x 1.5"LG, SS	15
28	92949A550	BHCS, 1/4-20 x 2" LNG.	2
29	95412A804	5/8-11 x 1.5" LG. STUD	2
30	98017A199	3/8" WASHER, SS	38
31	98017A204	7/16 WASHER,SS	64
32	98017A209	1/2 WASHER, SS	8
33	98017A215	5/8 WASHER, SS	15
34	98017A655	1/4" WASHER, SS	2
35	PARKER 6105-08	QUICK CONNECT, 1/2" MALE	2
36	PARKER 6105-16	QUICK CONNECT, 1" MALE	1
37	PARKER 6125-08	QUICK CONNECT, 1/2" FEMALE	2
38	PARKER 6125-16	QUICK CONNECT, 1" FEMALE	1

SECTION K-K
SCALE 1 : 4

DETAIL A
SCALE 1 : 1

DETAIL E
SCALE 1 : 2

DETAIL B
SCALE 1 : 1

DETAIL H
SCALE 1 : 2

28"

DETAIL F
SCALE 1 : 1

56 1/2"

SECTION A-A

Ø24"
Ø32"
Ø36"

DETAIL D
SCALE 1 : 1

DETAIL C
SCALE 1 : 1

REV.	DESCRIPTION	DATE	APR.
1	Released For Production	3/18/2011	KarlK

REVISION HISTORY

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE IN INCHES.
E.H. WACHS WORKMANSHIP STANDARDS (WI 17-01) SHALL APPLY TO ALL ITEMS NOT SPECIFIED ON DRAWING.
DO NOT SCALE DRAWING.

TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.030
THREE PLACE DECIMAL ±.005
ANGULAR ±1 MIN.

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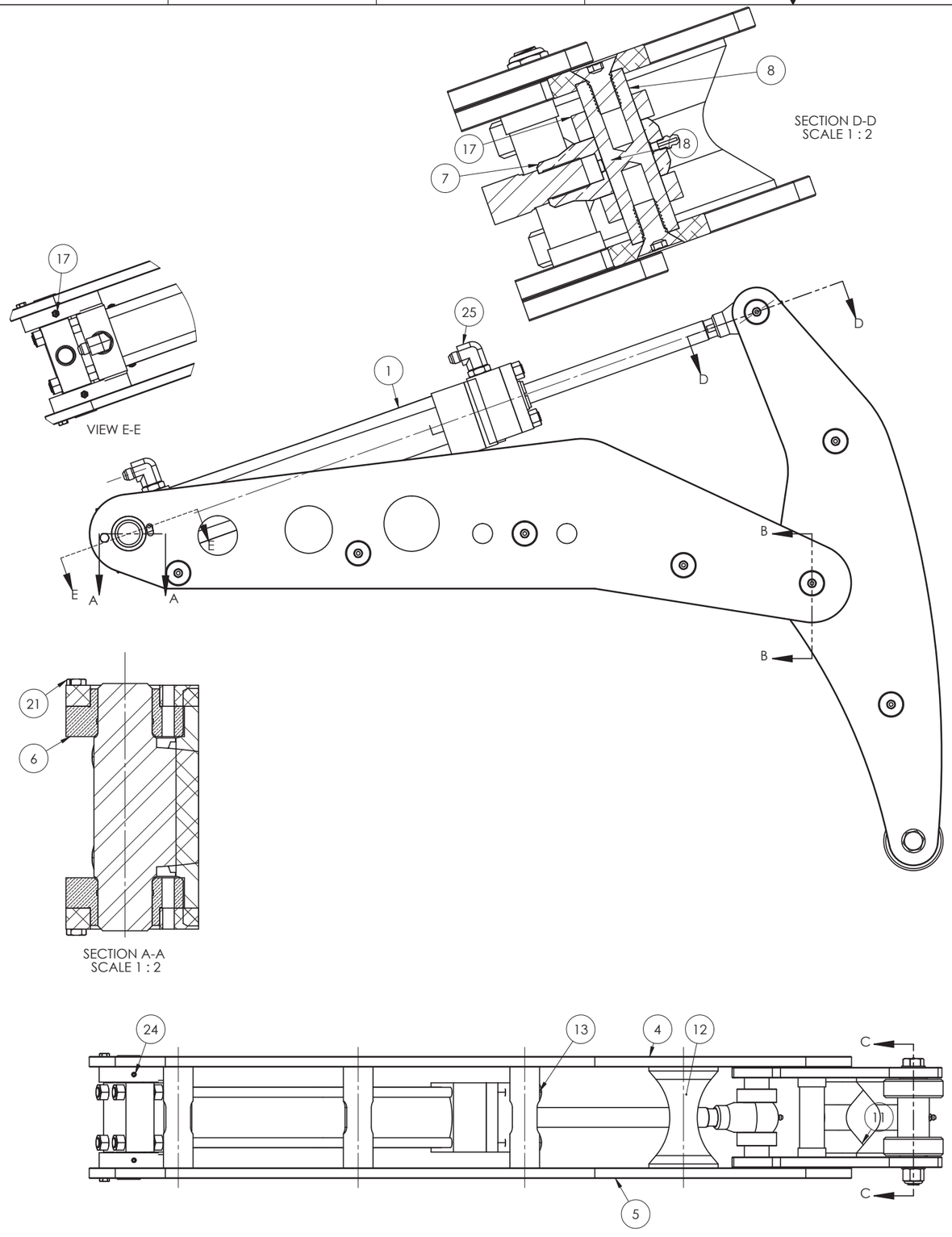
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: CLAMP, 36"-16" PIPE RANGE

DRAWN BY	APPROVED BY	SCALE
AG	.	1:8
DATE: 10/21/2009	DATE: .	SHEET: 1 OF 1

SIZE	DWG. NO.	REV.
D	10-010-36-420-R1	1

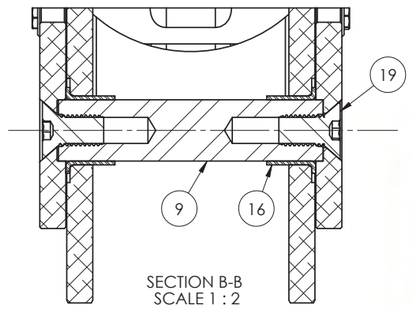
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-36-248	HYDRAULIC CYLINDER	2
2	10-010-36-201-R1	PLATE, 201-R1	1
3	10-010-36-201B-R1	PLATE, 201B-R1	1
4	10-010-36-202-R1	PLATE, 202-R1	1
5	10-010-36-202B-R1	PLATE, 202B-R1	1
6	10-010-00-205-R1	BUSHING, CYLINDER	2
7	10-010-00-204	ROD END, CYLINDER	2
8	10-010-00-206	ROD, 206	1
9	10-010-00-207	ROD,207	1
10	10-010-00-208	ROLLER	1
11	10-010-00-212	SPACER, 212	2
12	10-010-00-213	SPACER, 213	1
13	10-010-00-215	ROD, 215	3
14	10-010-00-210	TUBE, 210	1
15	Garlock 16FDU16	BUSHING	2
16	Garlock 20FDU16	BUSHING	2
17	6462K29	SHAFT COLLAR	2
18	1293K21	1/4-28 GREASE FITTING; SS	4
19	92210A796	FHCS 5/8"-11x 1.25" LG.	16
20	90715A185	LOCKNUT 5/8"-11,SS	1
21	92198A544	HHCS 1/4"-20 x 1.25" LG	2
22	92186A818	5/8-11 X 6 LG HHCS 316SS	1
23	98017A215	5/8 WASHER, SS	2
24	92311A556	1/4-28 x 1/4 LG SET SCREW	2
25	Parker 6-10_c5OX-S	ORB-JIC ELBOW	2



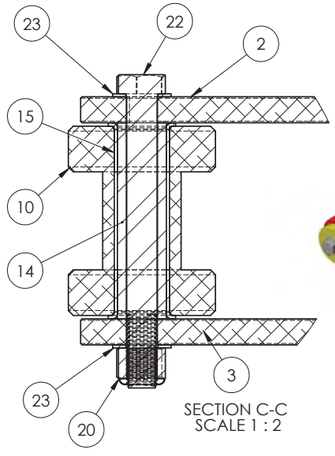
SECTION D-D
SCALE 1 : 2

VIEW E-E

SECTION A-A
SCALE 1 : 2



SECTION B-B
SCALE 1 : 2



SECTION C-C
SCALE 1 : 2

REV.	DESCRIPTION	DATE	APR.
2	ADDED ADDITIONAL GREASE LOCATIONS	1/29/2014	KarlK
1	PRODUCTION RELEASE	3/21/2011	KarlK

REVISION HISTORY

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FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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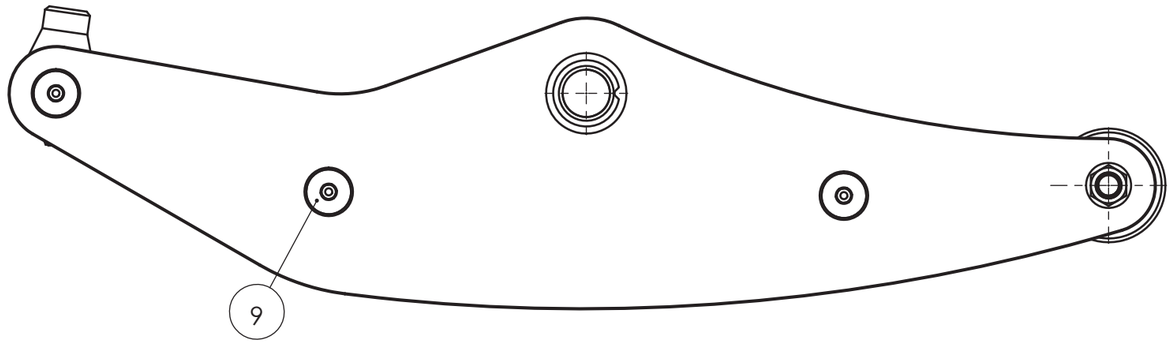
Lincolnshire, IL 60069
www.ehwachs.com

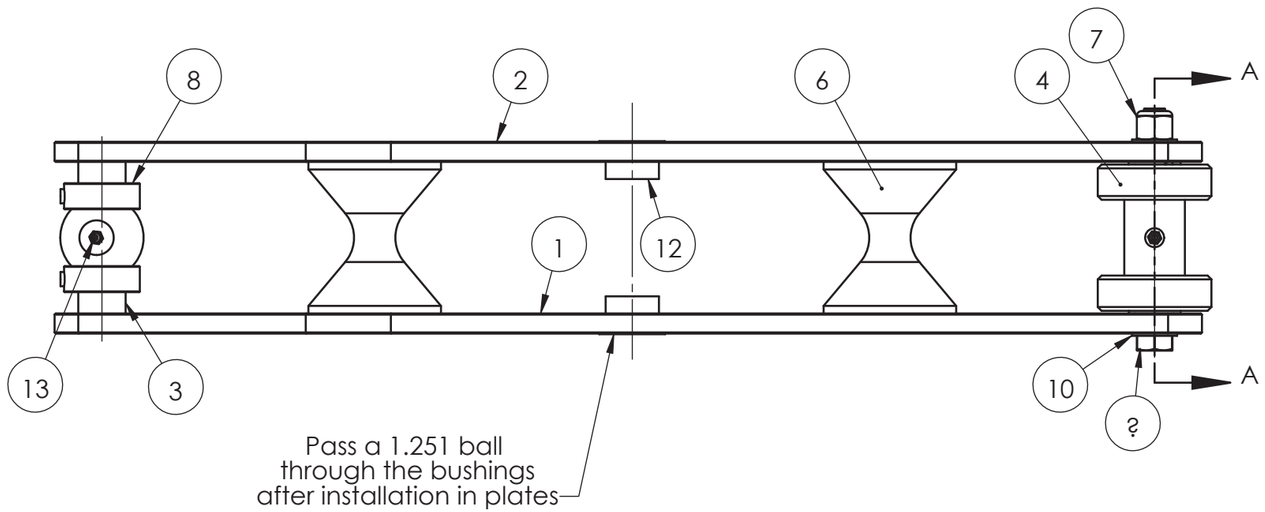
TITLE: ADJUSTABLE CLAMP WITH ACTUATOR

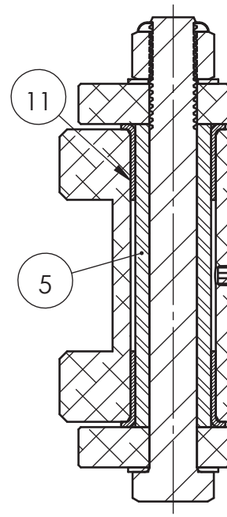
DRAWN BY	APPROVED BY	SCALE
AG	.	1:4
DATE	DATE	SHEET
10/19/09	.	1 OF 1

SIZE	DWG. NO.	REV.
C	10-010-36-421-R1	2

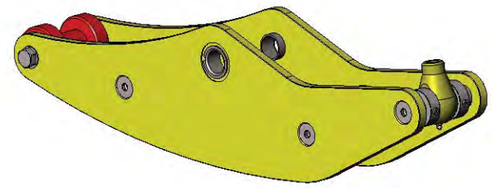
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-36-201-R1	PLATE, 201-R1	1
2	10-010-36-201B-R1	PLATE, 201B-R1	1
3	10-010-00-206	ROD, 206	1
4	10-010-00-208	ROLLER	1
5	10-010-00-210	TUBE, 210	1
6	10-010-00-212	SPACER, 212	2
7	90715A185	LOCKNUT 5/8"-11,SS	1
8	6462K29	SHAFT COLLAR	2
9	92210A796	FHCS 5/8"-11x 1.25" LG.	6
10	98017A215	5/8 WASHER, SS	2
11	Garlock 16FDU16	BUSHING	2
12	Garlock 20FDU16	BUSHING	2
13	1293K21	1/4-28 GREASE FITTING; SS	2
14	10-010-00-204	ROD END, CYLINDER	1
15	92186A818	5/8-11 X 6 LG HHCS 316SS	1







SECTION A-A
SCALE 1 : 2



REV.	DESCRIPTION	DATE	APR.
1	RELEASEDFOR PRODUCTION	3/15/2011	KarlK

REVISION HISTORY

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FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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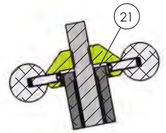
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: CLAMPING ARM

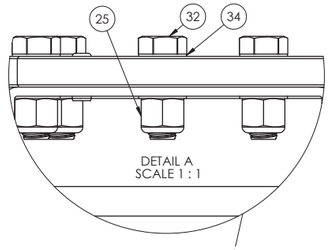
DRAWN BY	APPROVED BY	SCALE
MWG	KRP	1:8
DATE: 6-9-08	DATE: 6-9-08	SHEET: 1 OF 1

SIZE	DWG. NO.	REV.
B	**10-010-36-422-R1**	1

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-001	HYDRAULIC MOTOR	1
2	10-010-00-003	LINEAR BEARING	3
3	10-010-00-010	TENSION KNOB	1
4	10-010-00-023	ROD, 023	1
5	10-010-00-024	SPACER, 024	2
6	10-010-00-062	BALL JOINT ROD END	1
7	10-010-00-260	ROD, 260	1
8	10-010-00-261	ROD, 261	1
9	10-010-00-279-R1	BLOCK, 279	1
10	10-010-00-431C-R1	FRAME DRIVE ARM	1
11	10-010-00-433B-R1	ASSY, TENSIONING WHEEL	1
12	10-010-00-434B-R1	ASSY, TENSIONING WHEEL	2
13	10-010-36-022	TUBE, BOW FRAME	2
14	10-010-36-030C-R1	PLATE, 030C-R1	1
15	10-010-36-030D-R1	PLATE, 030D-R1	1
16	10-010-36-031C-R1	PLATE, 031C-R1	2
17	10-010-36-031D-R1	PLATE, 031D-R1	2
18	10-010-36-034	PLATE, 034	1
19	10-010-36-038	ROD, 215	2
20	H10-071-200	DWS FEED CONTROL UNIT	1
21	91860A032	WASHER 1/2", PH 17-4	1
22	90145A539	1/4 x 5/8 LG. DOWEL PIN	36
23	90298A712	SHOULDER SCREW 3/8"-16 x 1" LG, SS	2
24	91287A375	HHCS M10 x 1.5, 45mm LG, SS	12
25	91831A127	NUT, 3/8-16 SS NYLOCK	51
26	91831A137	LOCKNUT 1/2"-13, SS	1
27	92196A541	SHCS 1/4"-20 x 7/8" LG, SS	1
28	92198A628	HHCS 3/8"-16x1.5"LG, SS	2
29	92198A641	HHCS 3/8"-16x4.25"LG, SS	2
30	92198A753	HHCS 1/2"-13x3.75" LG, SS	1
31	92210A624	FSHCS 3/8"-16x1"LG	2
32	92240A625	HHCS 3/8"-16x 1-1/8"LG, SS	50
33	93475A280	WASHER 10mm, SS	12
34	98017A199	3/8" WASHER, SS	105
35	98017A209	1/2 WASHER, SS	4
36	92240A714	HHCS 1/2"-13 x 1.25" LG	2
37	Garlock 08FDU06	BUSHING	4
38	Parker 16_C5OX-SS	ORB TO JIC ELBOW	1
39	Parker 16-20_c5ox-s	ORB TO JIC ELBOW	1
40	D Wire 36 st		1

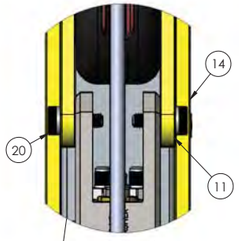


SECTION H-H
SCALE 1 : 2

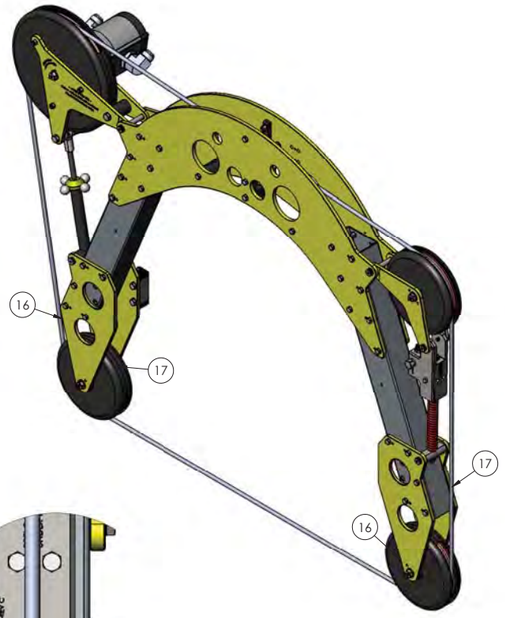


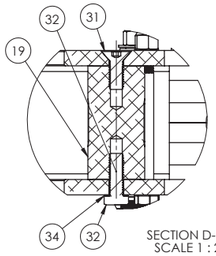
DETAIL A
SCALE 1 : 1

DETAIL J
SCALE 1 : 4

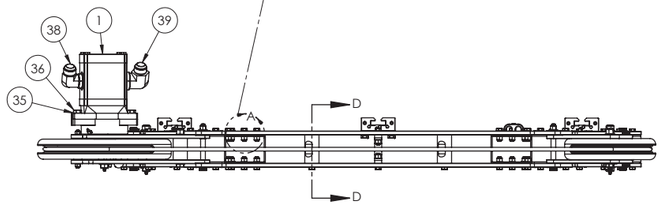


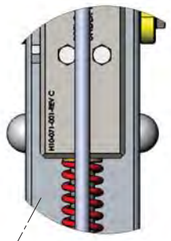
DETAIL C
SCALE 1 : 2



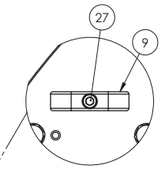


SECTION D-D
SCALE 1 : 2

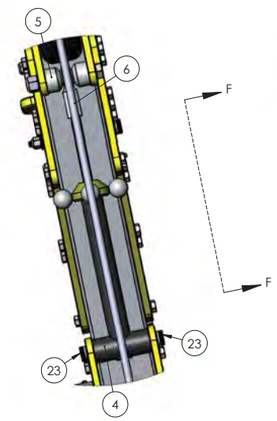




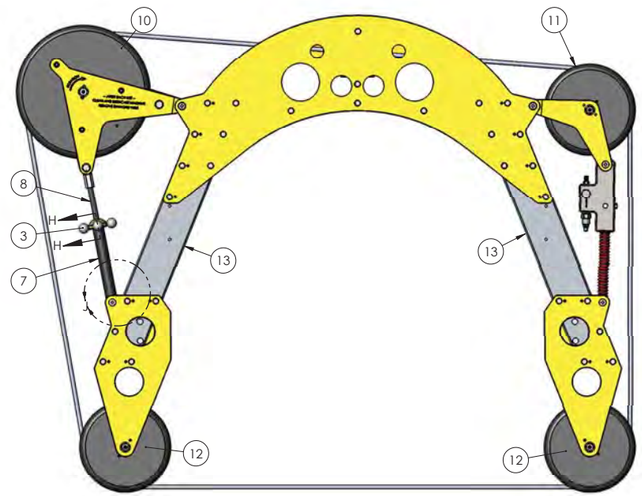
DETAIL E
SCALE 1 : 2

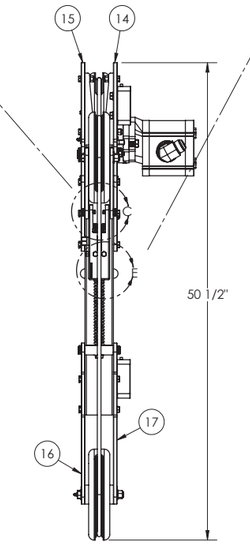


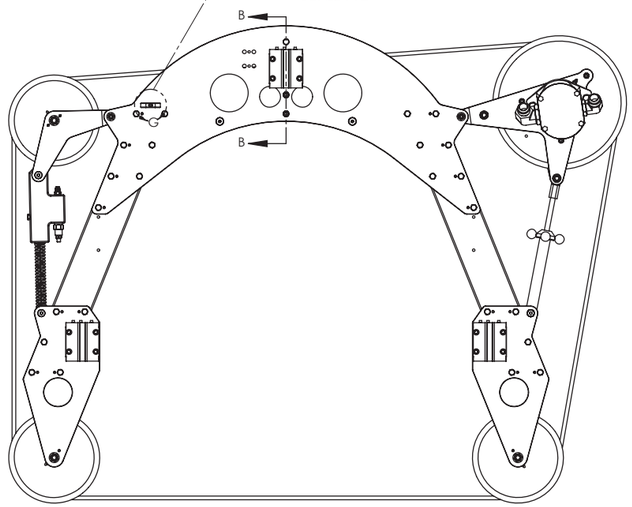
DETAIL G
SCALE 1 : 2

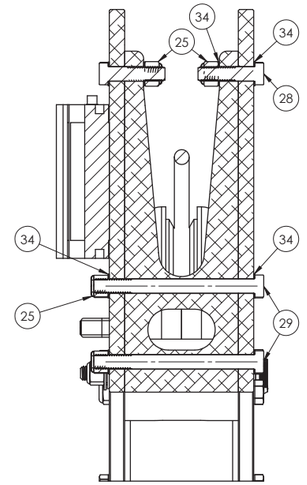


VIEW F-F
SCALE 1 : 4









SECTION B-B
SCALE 1 : 2

REV.	DESCRIPTION	DATE	APR.
1	PRODUCTION RELEASE	3/21/2011	KarlK

REVISION HISTORY

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE IN INCHES.
E.H. WACHS WORKMANSHIP STANDARDS (WI 17-01) SHALL APPLY TO ALL ITEMS NOT SPECIFIED ON DRAWING.
DO NOT SCALE DRAWING.

TOLERANCES:
FRACTIONS ± 1/32
ONE PLACE DECIMAL ± .015
TWO PLACE DECIMAL ± .010
THREE PLACE DECIMAL ± .005
ANGULAR: ± 1 MIN.

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600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

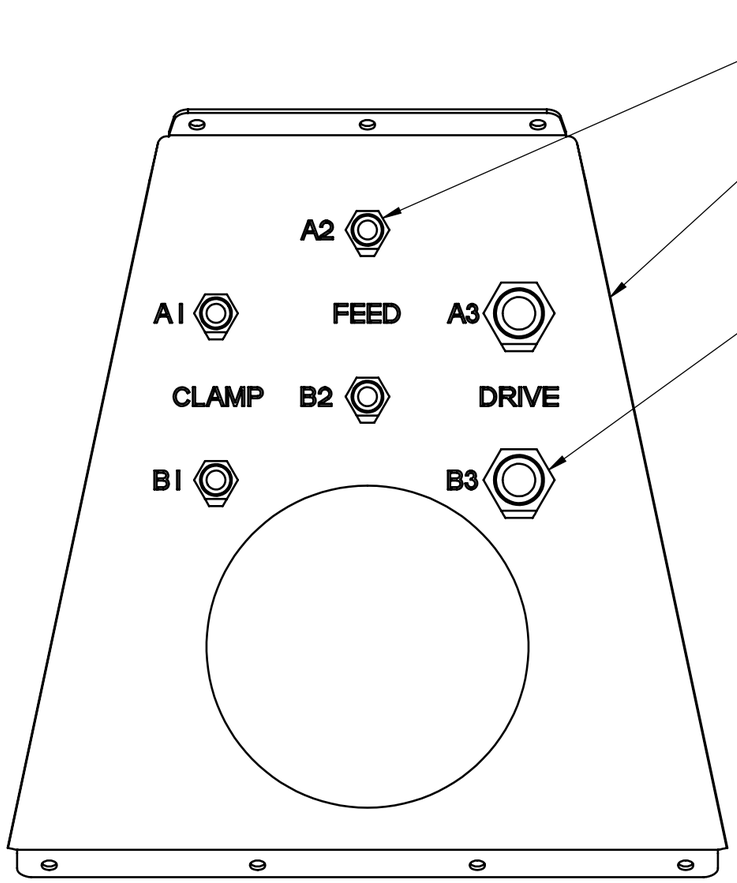
TITLE: WS-3616 BOW

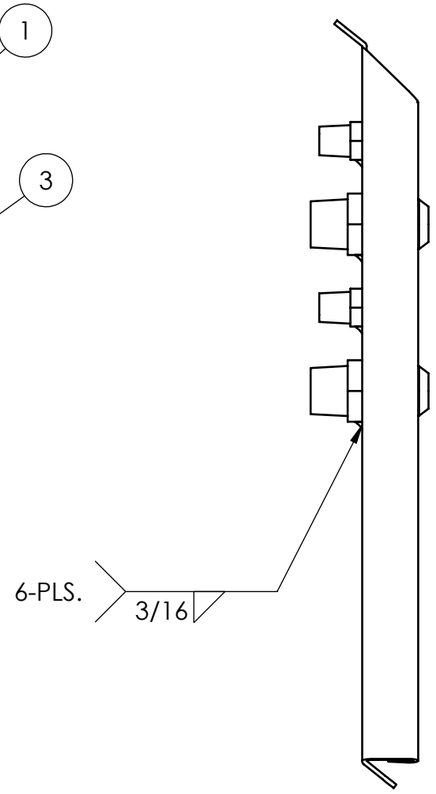
DRAWN BY	APPROVED BY	SCALE
AG	.	1:8
DATE: 10/29/09	DATE: .	SHEET: 1 OF 1

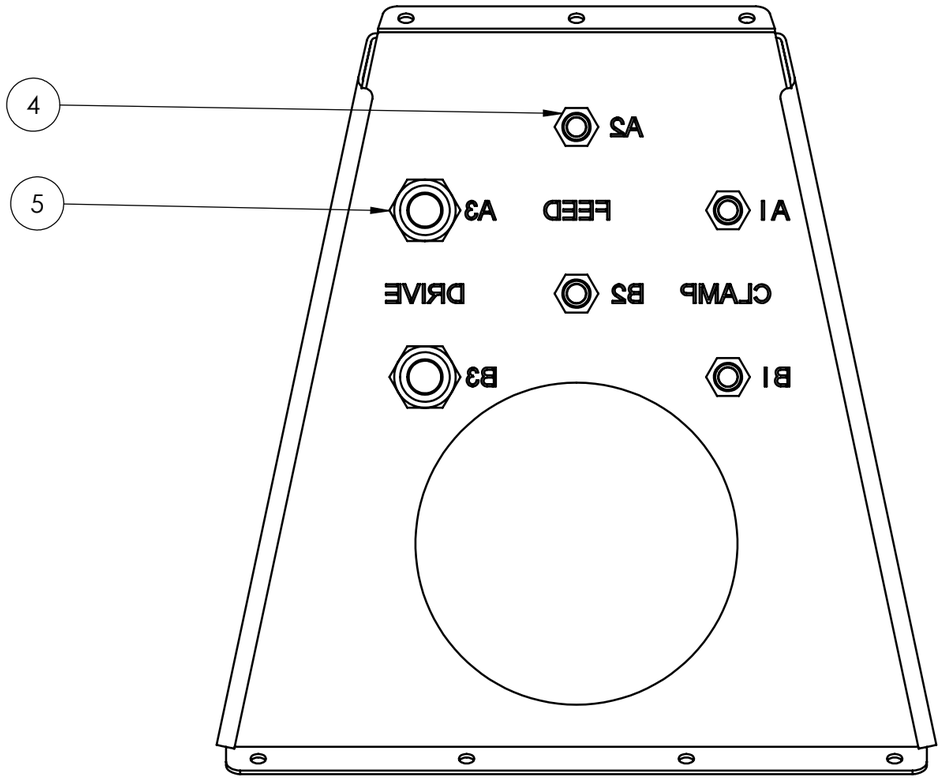
SIZE: D | DWG. NO.: 10-010-36-430-R1 | REV.: 1

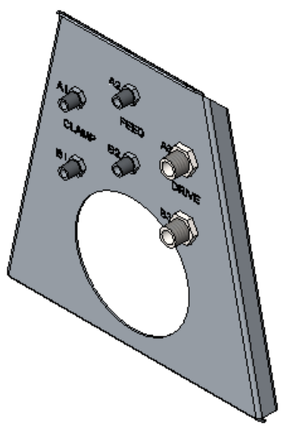
ASSEMBLY NOTE:
ALIGN BULKHEAD FITTINGS AS SHOWN, AND TIGHTLY FASTEN BEFORE WELDING.

ITEM NO.	PART NUMBER	DESCRIPTION	Default/ QTY.
1	10-010-36-224	PLATE, BULKHEAD	1
2	Brennan 2706-08-08	MP-MJ BULKHEAD STRAIGHT	4
3	Brennan 2706-16-16	MP-MJ BULKHEAD STRAIGHT	2
4	Brennan 0306-08	NUT, BULKHEAD	4
5	Brennan 0306-16	NUT, BULKHEAD	2









REV.	DESCRIPTION	DATE	APR.
1	RELEASED FOR PRODUCTION	12/7/09	KRP

REVISION HISTORY

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DO NOT SCALE DRAWING.

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FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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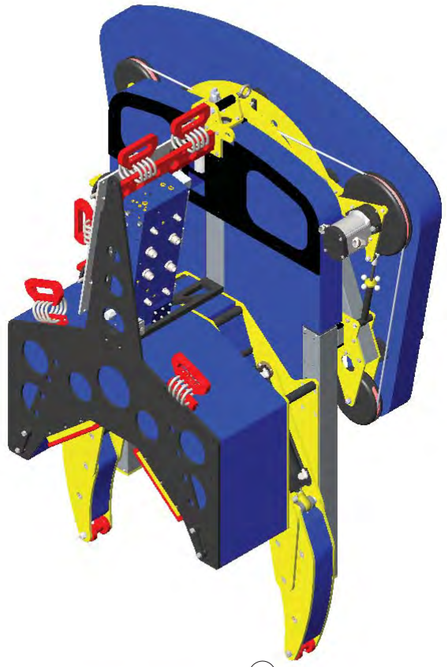
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

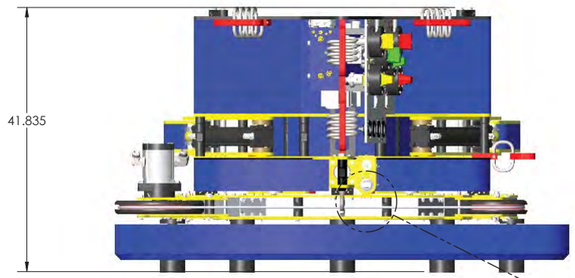
TITLE: WELDMENT, BULKHEAD PLATE

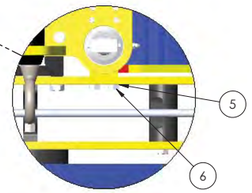
DRAWN BY	APPROVED BY	SCALE
MWG	KRP	1:4
DATE: 2-25-09	DATE: 2-25-09	SHEET: 1 OF 1

SIZE	DWG. NO.	REV.
B	**10-010-36-224B**	1

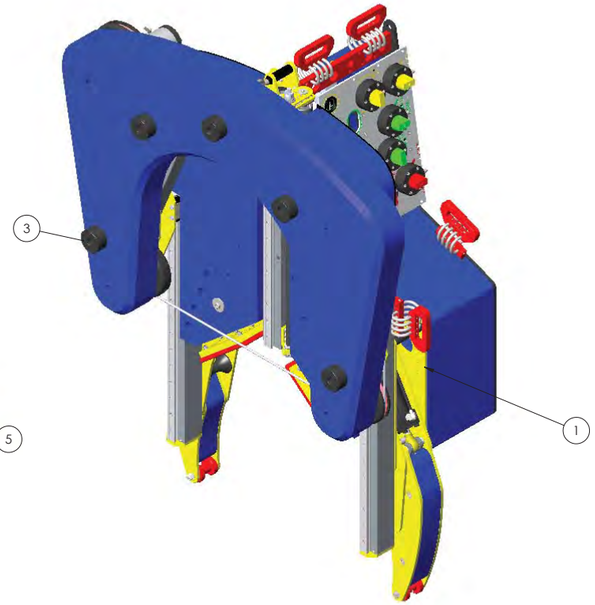
ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	10-010-36-410-ROV	DWDWS FRAME ASSEMBLY, 36"	1
2	10-010-36-430-ROV	DWDWS-3616 BOW	1
3	10-010-00-302	WASHER, C-BORED	5
4	10-010-36-303	TOP SLAB, 36"	1
5	98017A199	3/8" WASHER, SS	4
6	92240A623	HHCS 3/8"-16x7/8" LG,SS	4

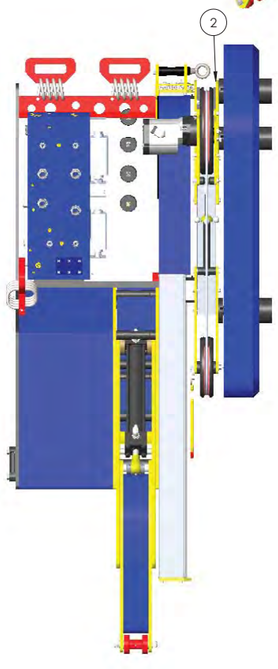


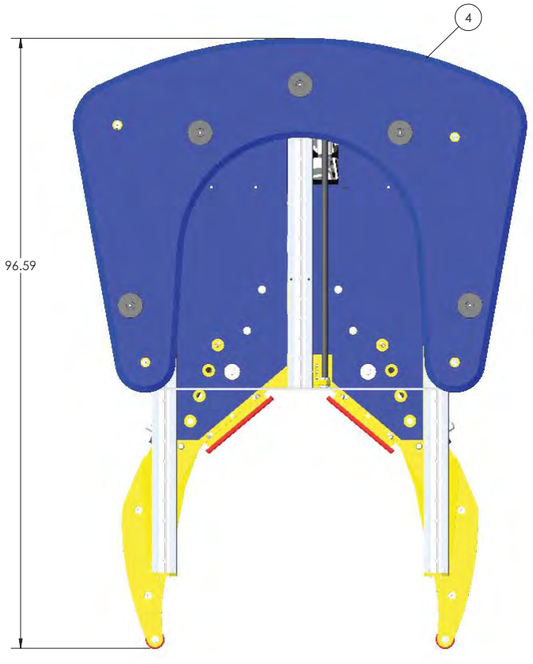


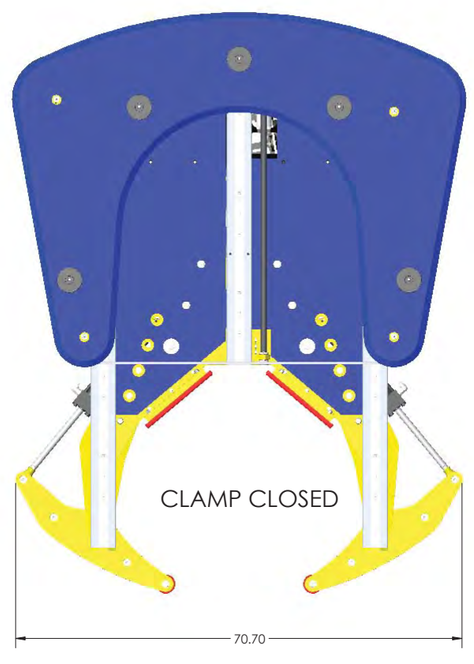


DETAIL A
SCALE 1 : 4









APPROX WEIGHT IN AIR: 1850 lbs (839 kg)

APPROX WEIGHT IN SEAWATER: 100 lbs (45 kg)

E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

REV.	DESCRIPTION	DATE	APR.

REVISION HISTORY

TITLE: DWDWS 3616 GENERAL ARRANGEMENT

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE IN INCHES.
E.H. WACHS WORKMANSHIP STANDARDS (WI 17-01) SHALL APPLY TO ALL ITEMS NOT SPECIFIED ON DRAWING.
DO NOT SCALE DRAWING.

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FRACTIONS ±1/32
ONE PLACE DECIMAL ±.010
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±1 MIN.

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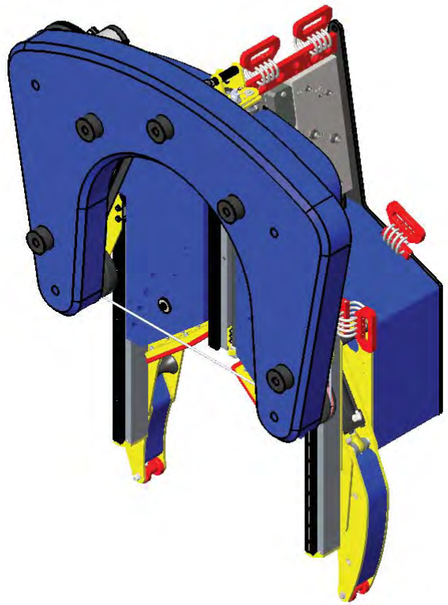
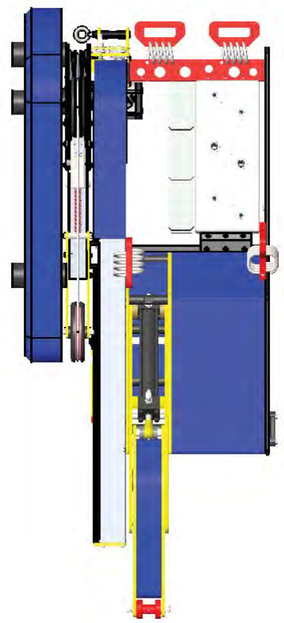
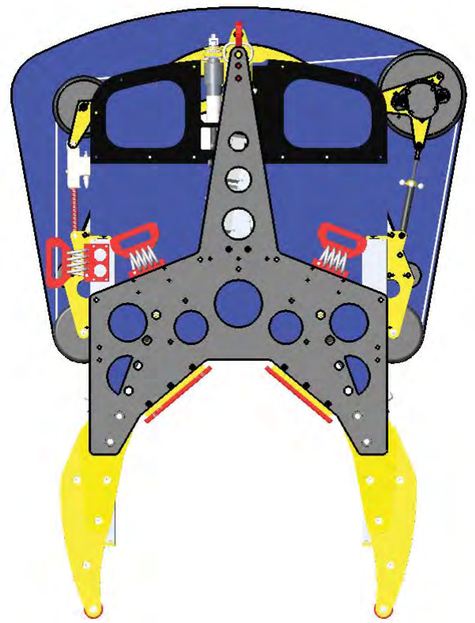
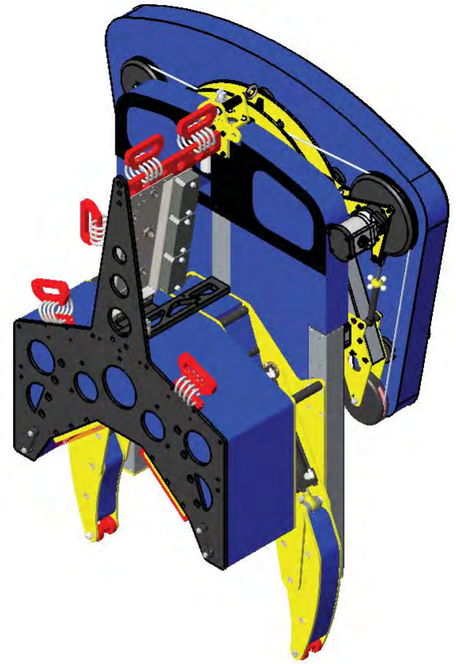
DRAWN BY	APPROVED BY	SCALE
Karl K	-	1:12
DATE	DATE	SHEET
10/23/2014		1 OF 2

SIZE	DWG. NO.	REV.
D	10-010-536-ROV	









SHOWN WITH REMOTE BULKHEAD PANEL INSTALLED

E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: WS3616 GENERAL ARRANGEMENT

DRAWN BY	APPROVED BY	SCALE
Karl K	.	1:12
DATE	DATE	SHEET
10/23/2014		2 OF 2

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TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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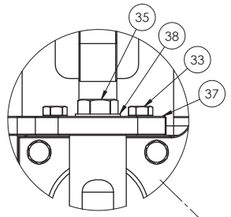
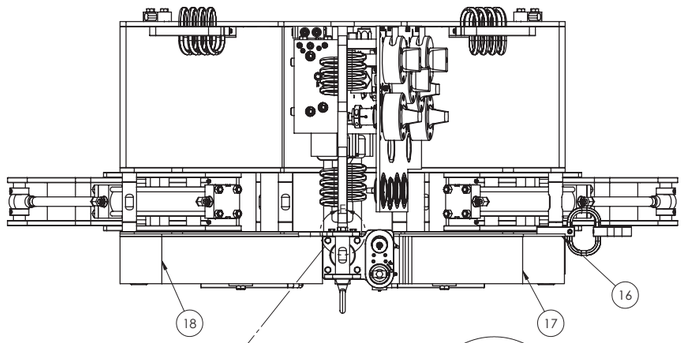
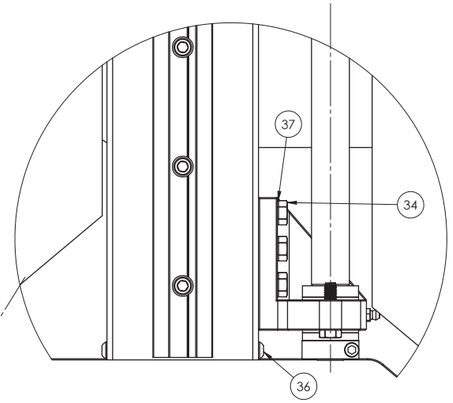
SIZE	DWG. NO.	REV.
D	10-010-536-ROV	

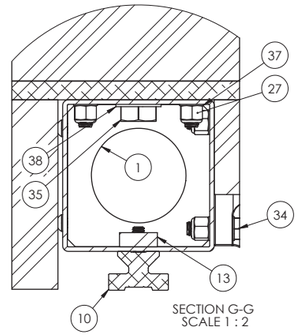


DETAIL E
SCALE 1 : 2

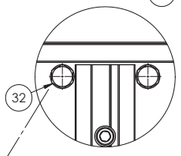




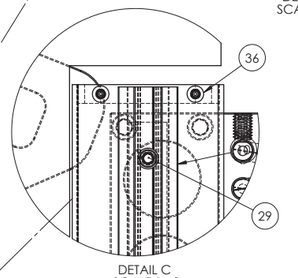
DETAIL D
SCALE 1 : 2



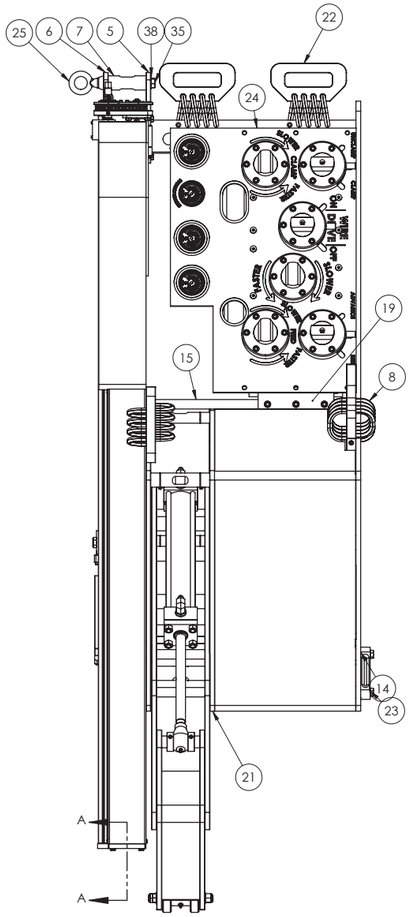
SECTION G-G
SCALE 1 : 2

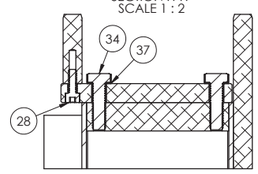


DETAIL K
SCALE 1 : 2

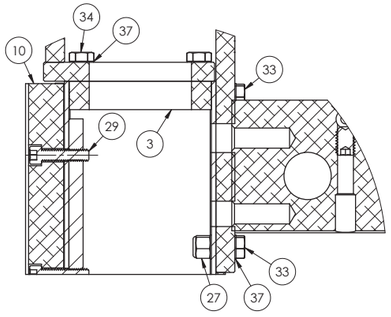


DETAIL C
SCALE 1 : 2

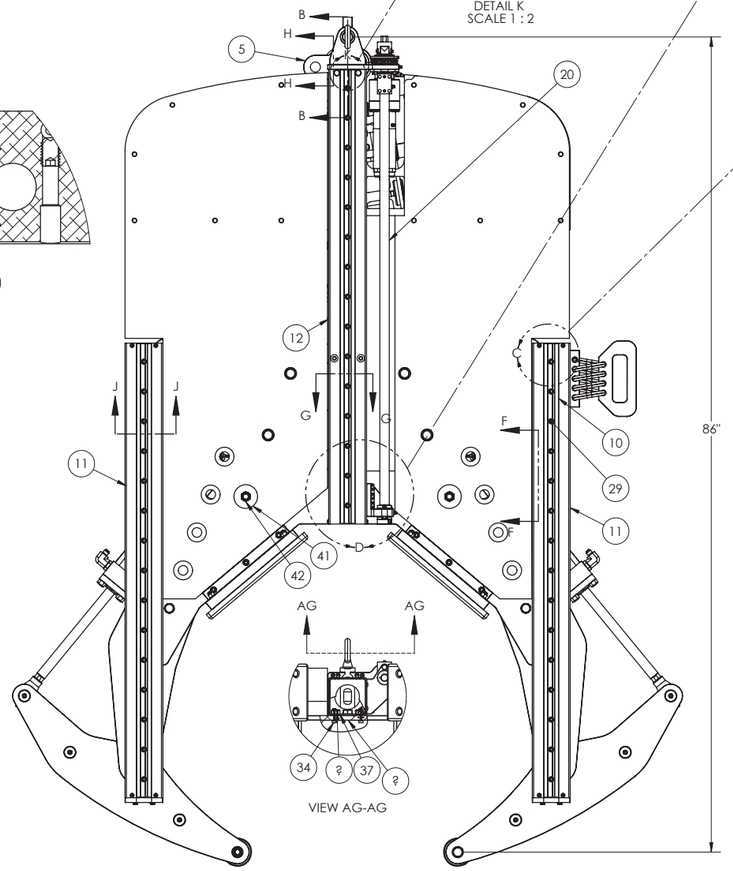




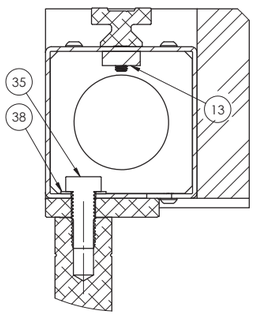
SECTION H-H
SCALE 1 : 2



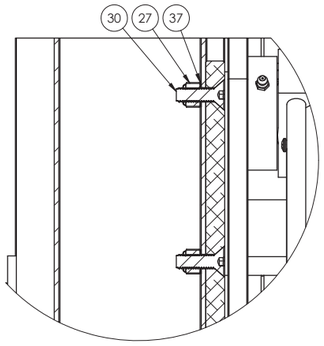
SECTION B-B
SCALE 1 : 2



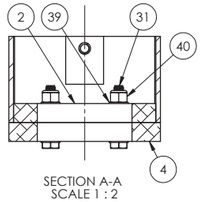
VIEW AG-AG



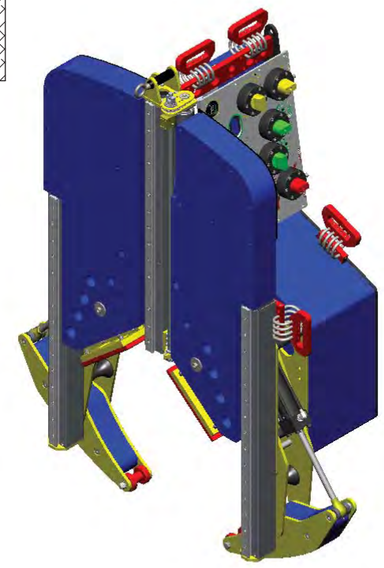
SECTION J-J
SCALE 1 : 2



SECTION F-F
SCALE 1 : 2



SECTION A-A
SCALE 1 : 2



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-027	PLATE, 027	3
2	10-010-00-027B	PLATE, 027B	2
3	10-010-00-028	PLATE, 028	1
4	10-010-00-029	PLATE, 029	2
5	10-010-00-246-R1	PLATE, 246-R1	1
6	10-010-00-246B-R1	PLATE, 246B-R1	1
7	10-010-00-251-ROV	ROD, 251	1
8	10-010-00-312	ROV GRAB HANDLE, COMPLIANT	3
9	10-010-00-419B	Flow Divider Combiner Valve Assembly	1
10	10-010-36-001	LINEAR GUIDE RAIL	3
11	10-010-36-020	TUBE, LINEAR GUIDE MOUNTING	2
12	10-010-36-021	TUBE, LINEAR GUIDE MOUNTING	1
13	10-010-36-023	TAPPED RAIL	3
14	10-010-36-305	PLATE, 203	1
15	10-010-36-311	BRACKET, 36" ROV FLOTATION	1
16	10-010-36-314	BACK, FOAM MOUNTING PLATE	1
17	10-010-36-315	FLOTATION	1
18	10-010-36-316	FLOTATION	1
19	10-010-36-328	LOWER CONTROL MOUNTING BRACKET	1
20	10-010-36-411-R1	FRAME FEED	1
21	10-010-36-420-ROV	CLAMP, 36"-16" PIPE RANGE, ROV	1
22	10-010-36-441	BRACKET AND GRAB HANDLE ASSEMBLY	1
23	10-010-36-443	CLAMP PIN ASSEMBLY, ROV	2
24	H10-084-200-AA	ROV INTERFACE PANEL	1
25	3014T867	EYEBOLT	1
26	90145A539	1/4 x 5/8 LG. DOWEL PIN	2
27	91831A127	NUT, 3/8-16 SS NYLOCK	32
28	92196A539	SHCS 1/4"-20 x 5/8" LG, SS	4
29	92196A585	SHCS, 5/16-18 X 1-1/4, 18-8SS	45
30	92210A626	FSHCS 3/8"-16x1.25"LG,SS	16
31	92240A546	HHCS 1/4"-20x1.5"LG, SS	8
32	92240A622	HHSC 3/8"-16 x 3/4" LG, SS	2
33	92240A625	HHCS 3/8"-16x 1-1/8"LG, SS	4
34	92240A626	HHCS 3/8"-16x1.5"LG, SS	18
35	92240A798	HHCS 5/8"-11 x 1.5"LG, SS	4
36	92949A537	BSHCS 1/4"-20x1/2"LG, SS	20
37	98017A199	3/8" WASHER, SS	57
38	98017A215	5/8 WASHER, SS	4
39	98017A655	1/4" WASHER, SS	16
40	91831A029	NYLOCK NUT, 1/4-20, 18-8SS	8
41	92303A110	5/8 x 2-1/2 od WASHER SS	2
42	90101A038	5/8-11 THIN LOCKNUT SS	2
43	10-010-36-322	DWDWS BULKHEAD ASSEMBLY	-

REV.	DESCRIPTION	DATE	APR.
2	ADDED ROV VERSION	10/14/2014	Karl K
1	Released For Production	3/17/2011	KarlK

REVISION HISTORY

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ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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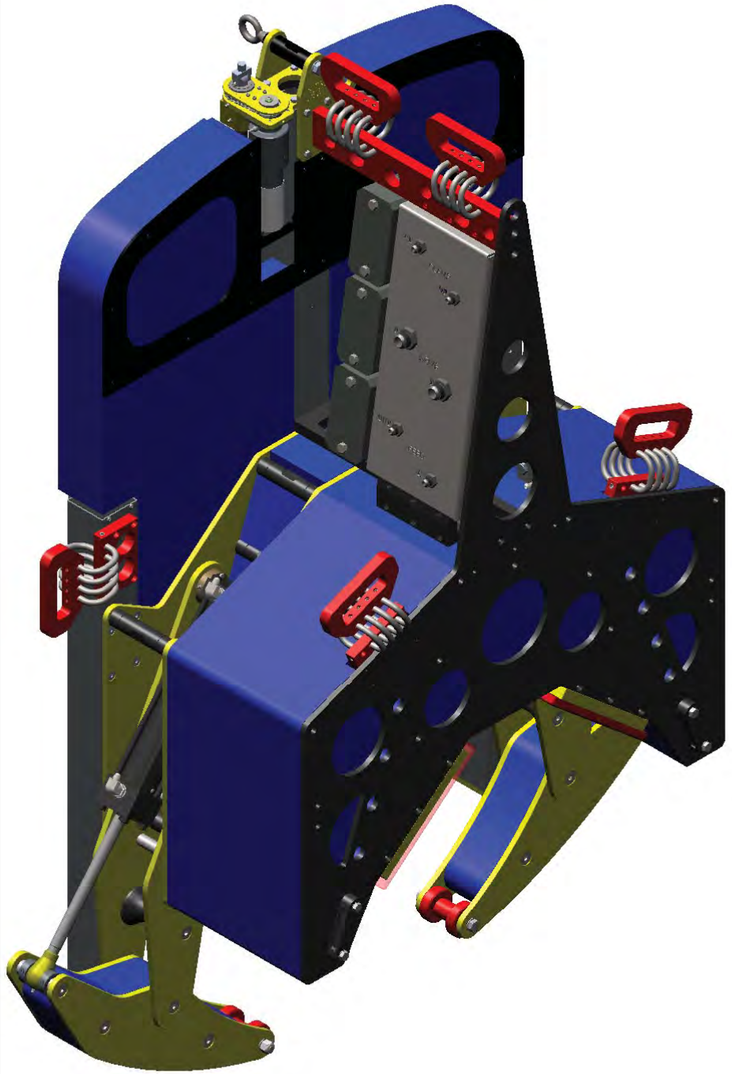
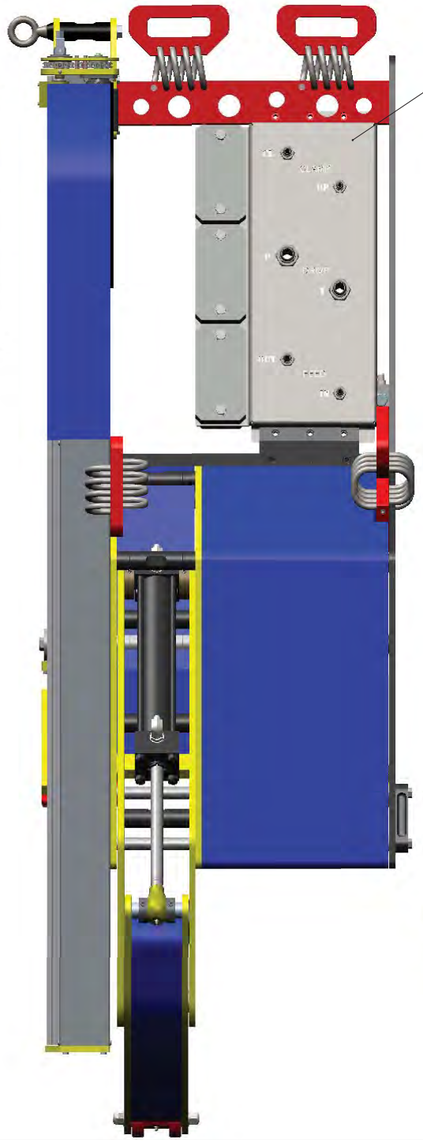
E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

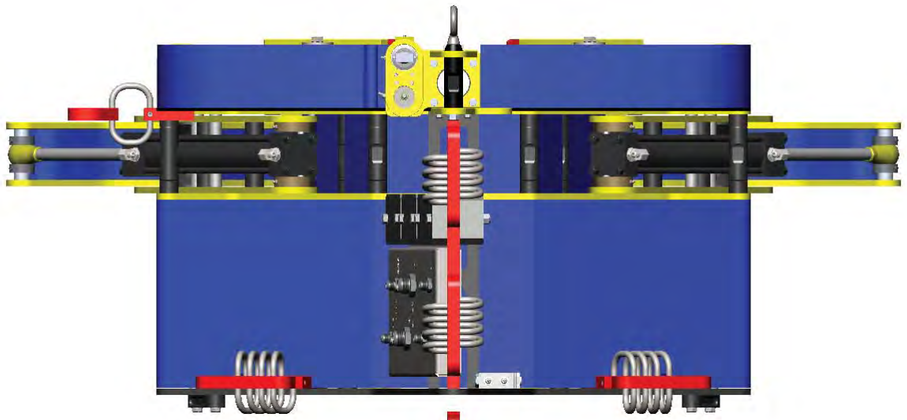
TITLE: DWDWS FRAME ASSEMBLY, 36"

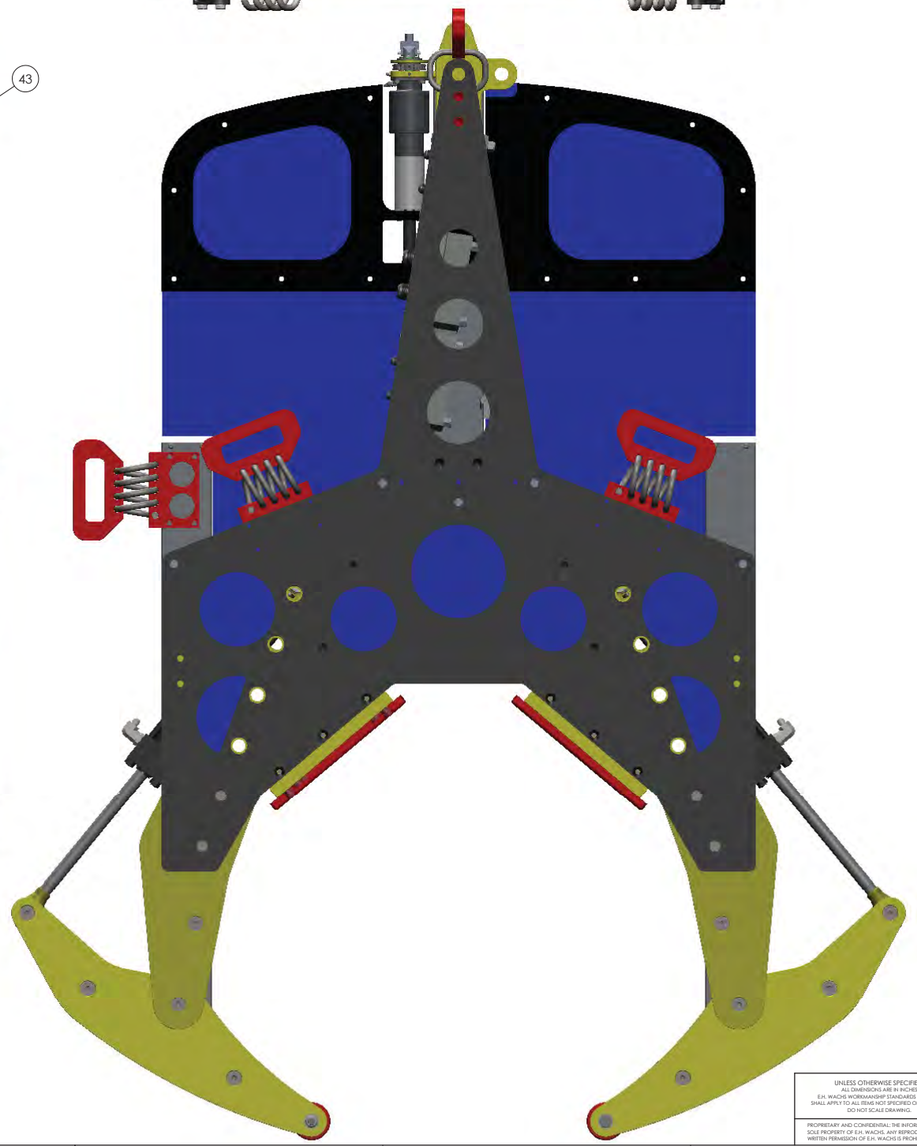
DRAWN BY	APPROVED BY	SCALE
AG	.	1:8
DATE	DATE	SHEET
10/27/09	.	1 OF 2

SIZE: D | DWG. NO.: 10-010-36-410-ROV | REV.: 2









BULKHEAD PANEL FOR REMOTE CONTROL SHONW

E.H. WACHS 600 Knightsbridge Parkway Lincolnshire, IL 60069 www.ehwachs.com			
TITLE: DWDWS FRAME ASSEMBLY, 36"			
UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS ARE IN INCHES. E.H. WACHS WORKMANSHIP STANDARDS (WI 17-01) SHALL APPLY TO ALL ITEMS NOT SPECIFIED ON DRAWING. DO NOT SCALE DRAWING.	TOLERANCES: FRACTIONS ± 1/32 ONE PLACE DECIMAL ± .015 TWO PLACE DECIMAL ± .010 THREE PLACE DECIMAL ± .005 ANGULAR ± 15 MIN.	DRAWN BY: AG	APPROVED BY: .	SCALE: 1:6
		DATE: 10/27/09	DATE: .	SHEET: 2 OF 2
PROPRIETARY AND CONFIDENTIAL: THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF E.H. WACHS. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF E.H. WACHS IS PROHIBITED.		SIZE: D	DWG. NO.: 10-010-36-410-ROV	REV.: 2

ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	10-010-00-209-R1	ROD,209-R1	9
2	10-010-36-203-R1	PLATE,203-R1	1
3	10-010-36-203B-R1	PLATE, 203B-R1	1
4	10-010-36-211-R1	BAR, 211-R1	4
5	10-010-36-211-ROV	BAR, 211-R1	2
6	10-010-36-220-R1	PLATE, 220-R1	2
7	10-010-36-221	SHOE,221	4
8	10-010-36-223	ROD, 223	4
9	10-010-36-306	REAR FLOTATION, 36" DWDWS	1
10	10-010-36-307	CLAMP SECTION FLOTATION	1
11	10-010-36-308	DESCRIPTION	8
12	10-010-36-421-ROV	ADJUSTABLE CLAMP WITH ACTUATOR	2
13	91831A127	NUT, 3/8-16 SS NYLOCK	12
14	91831A133	HEX LOCKNUT 7/16"-14, SS	4
15	92186A677	HHCS, 7/16-14 X 2" (316 SS)	8
16	92186A681	HHCS, 7/16-14 X 3" (316 SS)	24
17	92210A632	FHCS 3/8"-16 x 2" LG	12
18	92240A798	HHCS 5/8"-11 x 1.5"LG, SS	11
19	95412A804	5/8-11 x 1.5" LG, STUD	4
20	98017A199	3/8" WASHER, SS	12
21	98017A204	7/16 WASHER,SS	36
22	98017A209	1/2 WASHER, SS	1
23	98017A215	5/8 WASHER, SS	11
24	92198A752	HHCS, 1/2"-13 X 3-1/4" LNG., SS	1
25	91831A137	LOCKNUT 1/2"-13, SS	1
26	3609K2	ZINC ANODE	1
27	92210A673	7/16x1-1/2 FHCS-SS	4

SECTION K-K
SCALE 1 : 4

DETAIL A
SCALE 1 : 1

DETAIL H
SCALE 1 : 2

28"

DETAIL B
SCALE 1 : 1.5

56 1/2"

SECTION A-A

Ø24"
Ø32"
Ø36"

CENTER AND REAR FLOTATION REMOVED

REV.	DESCRIPTION	DATE	APR.
2	ADDED ROV VERSION	10/15/2014	Karl K
1	Released For Production	3/18/2011	KarlK

REVISION HISTORY

UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS ARE IN INCHES. E.H. WACHS WORKMANSHIP STANDARDS (WI 17-01) SHALL APPLY TO ALL ITEMS NOT SPECIFIED ON DRAWING. DO NOT SCALE DRAWING.

TOLERANCES: FRACTIONS ±1/32 ONE PLACE DECIMAL ±.015 TWO PLACE DECIMAL ±.010 THREE PLACE DECIMAL ±.005 ANGULAR ±15 MIN.

PROPRIETARY AND CONFIDENTIAL: THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF E.H. WACHS. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF E.H. WACHS IS PROHIBITED.

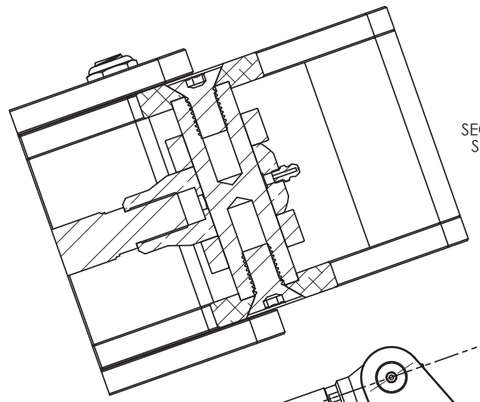
E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: CLAMP, 36"-16" PIPE RANGE, ROV

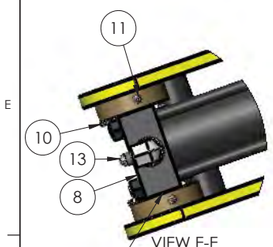
DRAWN BY	APPROVED BY	SCALE
AG	.	1:8
DATE 10/21/2009	DATE .	SHEET 1 OF 1

SIZE	DWG. NO.	REV.
D	10-010-36-420-ROV	2

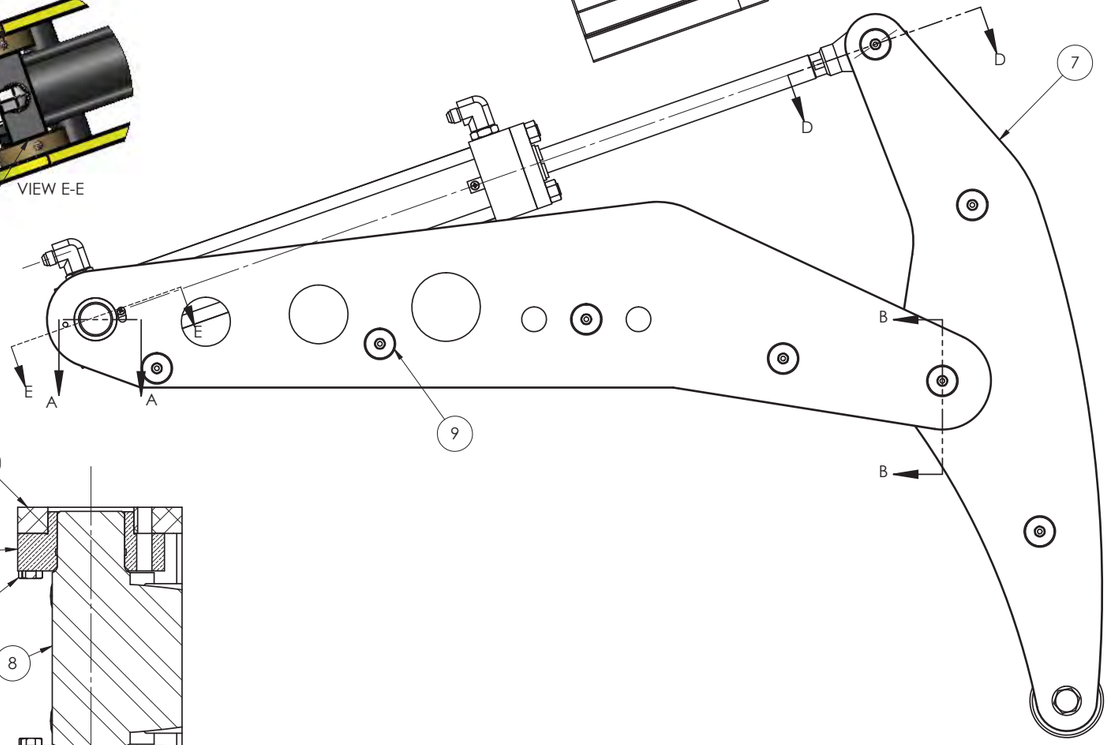
ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	10-010-00-205-R1	BUSHING, CYLINDER	2
2	10-010-00-207	ROD,207	1
3	10-010-00-213	SPACER, 213	1
4	10-010-00-215	ROD, 215	3
5	10-010-36-202-R1	PLATE, 202-R1	1
6	10-010-36-202B-R1	PLATE, 202B-R1	1
7	10-010-36-422-ROV	36" CLAMPING ARM, ROV	1
8	10-010-36-248	HYDRAULIC CYLINDER	1
9	92210A796	FHCS 5/8"-11x 1.25" LG.	10
10	92198A544	HHCS 1/4"-20 x 1.25" LG	2
11	1293K21	1/4-28 GREASE FITTING; SS	2
12	92311A556	1/4-28 x 1/4 LG SET SCREW	2
13	Parker 6-10_c5OX-S	ORB-JIC ELBOW	2

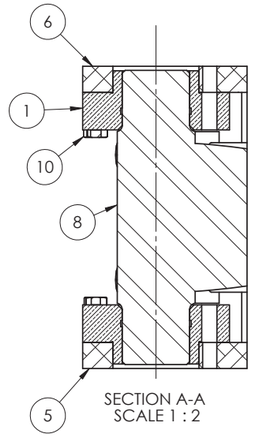


SECTION D-D
SCALE 1 : 2

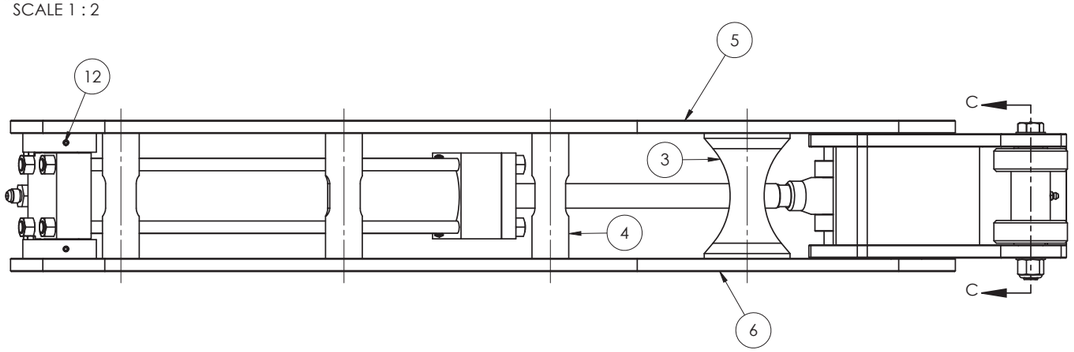


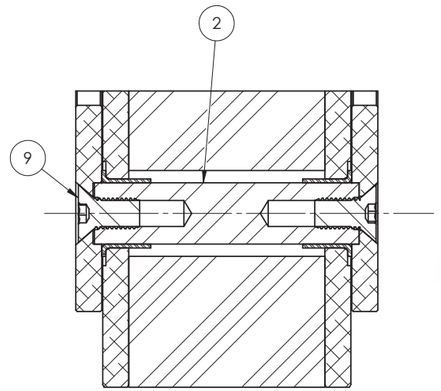
VIEW E-E



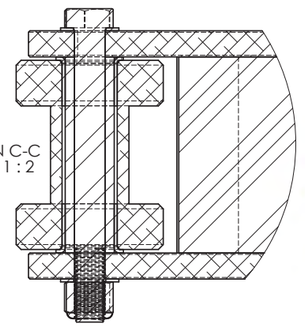


SECTION A-A
SCALE 1 : 2





SECTION B-B
SCALE 1 : 2



SECTION C-C
SCALE 1 : 2

REV.	DESCRIPTION	DATE	APR.
3	ADDED ROV VERSION	10/15/2014	Karl K
2	ADDED ADDITIONAL GREASE LOCATIONS	1/29/2014	KarlK
1	PRODUCTION RELEASE	3/21/2011	KarlK

REVISION HISTORY

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E.H. WACHS WORKMANSHIP STANDARDS (WI 17-01) SHALL APPLY TO ALL ITEMS NOT SPECIFIED ON DRAWING.
DO NOT SCALE DRAWING.

TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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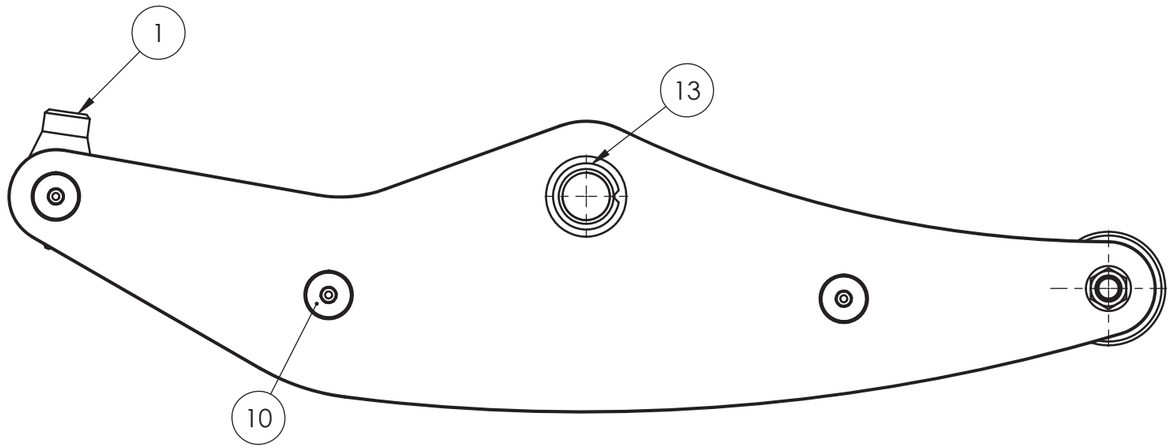
E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

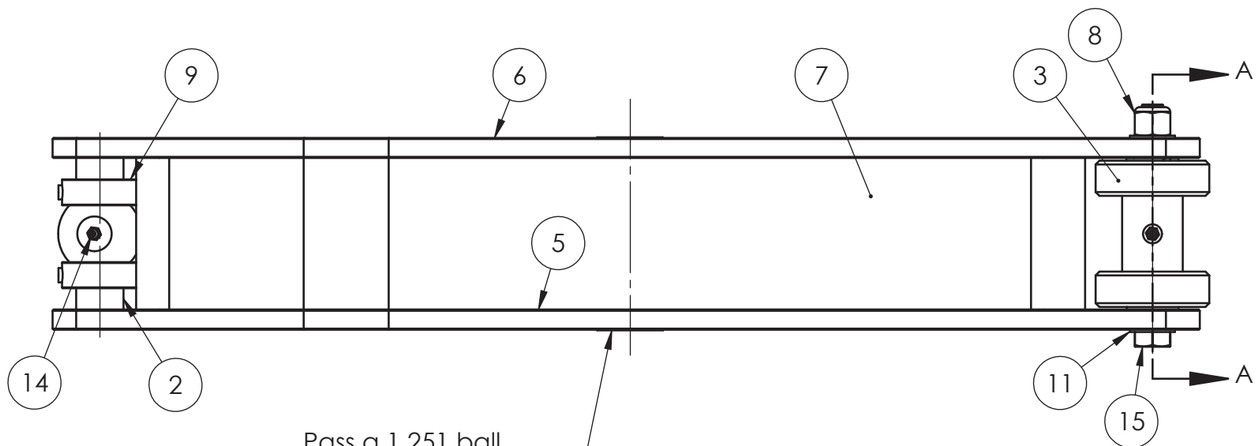
TITLE: 36" ADJUSTABLE CLAMP WITH ACTUATOR, ROV

DRAWN BY	APPROVED BY	SCALE
AG	.	1:4
DATE	DATE	SHEET
10/19/09	.	1 OF 1

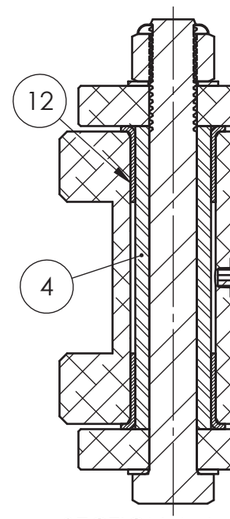
SIZE	DWG. NO.	REV.
C	**10-010-36-421-ROV**	3

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-204	ROD END, CYLINDER	1
2	10-010-00-206	ROD, 206	1
3	10-010-00-208	ROLLER	1
4	10-010-00-210	TUBE, 210	1
5	10-010-36-201-R1	PLATE, 201-R1	1
6	10-010-36-201B-R1	PLATE, 201B-R1	1
7	10-010-36-442	CLAMP ARM FLOTATION	1
8	90715A185	LOCKNUT 5/8"-11,SS	1
9	6462K29	SHAFT COLLAR	2
10	92210A796	FHCS 5/8"-11x 1.25" LG.	6
11	98017A215	5/8 WASHER, SS	2
12	Garlock 16FDU16	BUSHING	2
13	Garlock 20FDU16	BUSHING	2
14	1293K21	1/4-28 GREASE FITTING; SS	2
15	92186A818	5/8-11 X 6 LG HHCS 316SS	1

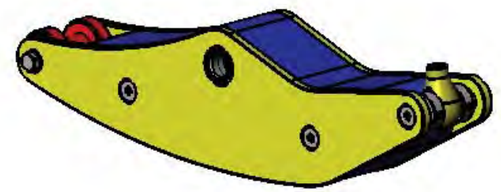




Pass a 1.251 ball
through the bushings
after installation in plates



SECTION A-A
SCALE 1 : 2



REV.	DESCRIPTION	DATE	APR.
2	ADDED ROV VERSION	10/15/2014	Karl K
1	RELEASEDFOR PRODUCTION	3/15/2011	KarlK

REVISION HISTORY

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ALL DIMENSIONS ARE IN INCHES.
E.H. WACHS WORKMANSHIP STANDARDS (WI 17-01)
SHALL APPLY TO ALL ITEMS NOT SPECIFIED ON DRAWING.
DO NOT SCALE DRAWING.

TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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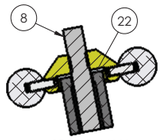
E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

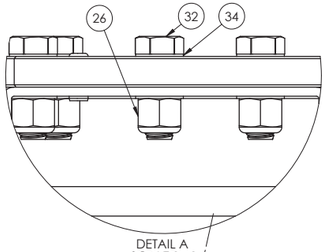
TITLE: 36" CLAMPING ARM, ROV

DRAWN BY	APPROVED BY	SCALE
MWG	KRP	1:8
DATE	DATE	SHEET
6-9-08	6-9-08	1 OF 1

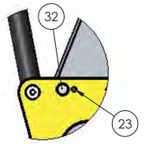
SIZE	DWG. NO.	REV.
B	**10-010-36-422-ROV**	2



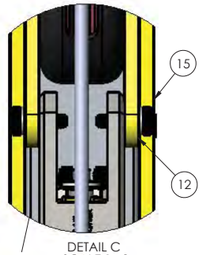
SECTION H-H
SCALE 1 : 2



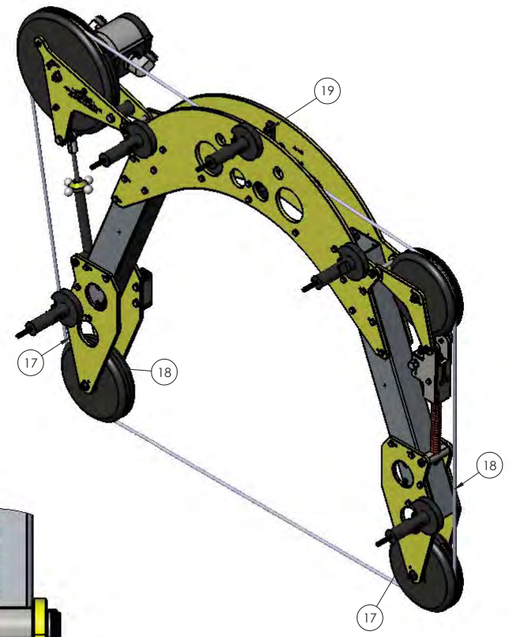
DETAIL A
SCALE 1 : 1

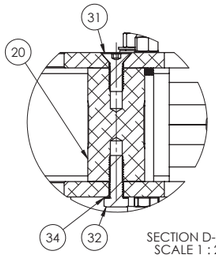


DETAIL J
SCALE 1 : 4

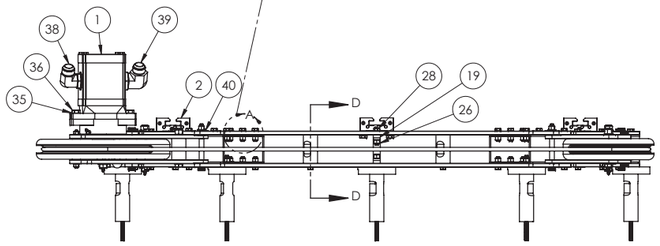


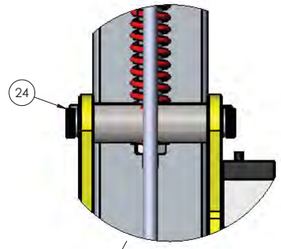
DETAIL C
SCALE 1 : 2



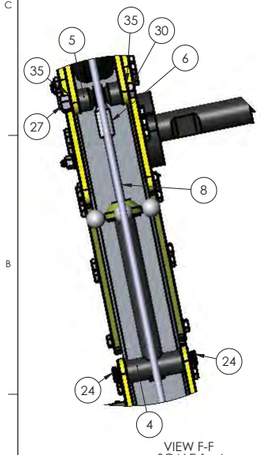


SECTION D-D
SCALE 1 : 2

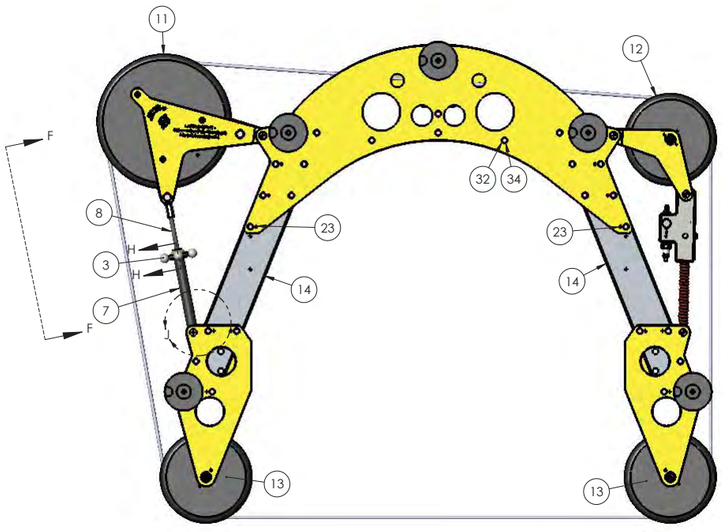


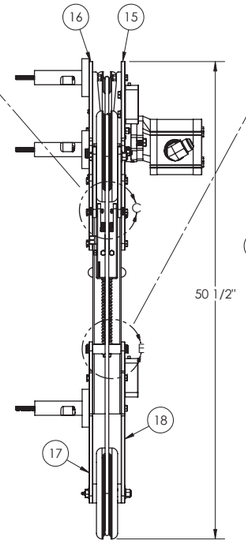


ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-001	HYDRAULIC MOTOR	1
2	10-010-00-003	LINEAR BEARING	3
3	10-010-00-010	TENSION KNOB	1
4	10-010-00-023	ROD, 023	1
5	10-010-00-024	SPACER, 024	2
6	10-010-00-062	BALL JOINT ROD END	1
7	10-010-00-260	ROD, 260	1
8	10-010-00-261	ROD, 261	1
9	10-010-00-301	SPACER, TOP SLAB	5
10	10-010-00-304	STANDOFF, TOP SLAB	5
11	10-010-00-431C-R1	FRAME DRIVE ARM	1
12	10-010-00-433B-R1	ASSY, TENSIONING WHEEL	1
13	10-010-00-434B-R1	ASSY, IDLER WHEEL	2
14	10-010-36-022	TUBE, BOW FRAME	2
15	10-010-36-030C-R1	PLATE, 030C-R1	1
16	10-010-36-030D-R1	PLATE, 030D-R1	1
17	10-010-36-031C-R1	PLATE, 031C-R1	2
18	10-010-36-031D-R1	PLATE, 031D-R1	2
19	10-010-36-034	PLATE, 034	1
20	10-010-36-038	ROD, 215	2
21	H10-071-200	DWS FEED CONTROL UNIT	1
22	91860A032	WASHER 1/2", PH 17-4	1
23	90145A539	1/4 x 5/8 LG. DOWEL PIN	36
24	90298A712	SHOULDER SCREW 3/8"-16 x 1" LG, SS	2
25	91287A375	HHCS M10 x 1.5, 45mm LG, SS	12
26	91831A127	NUT, 3/8-16 SS NYLOCK	51
27	91831A137	LOCKNUT 1/2"-13, SS	1
28	92198A628	HHCS 3/8"-16x1.5"LG, SS	1
29	92198A641	HHCS 3/8"-16x4.25"LG, SS	2
30	92198A753	HHCS 1/2"-13x3.75" LG, SS	1
31	92210A624	FSHCS 3/8"-16x1"LG	2
32	92240A625	HHCS 3/8"-16x 1-1/8"LG, SS	46
33	93475A280	WASHER 10mm, SS	12
34	98017A199	3/8" WASHER, SS	100
35	98017A209	1/2 WASHER, SS	4
36	92240A714	HHCS 1/2"-13 x 1.25" LG	2
37	95412A650	3/8-16 X 8 LG FULLY THREADED ROD	5
38	Parker 16_C5OX-SS	ORB TO JIC ELBOW	1
39	Parker 16-20_C5OX-SS	ORB TO JIC ELBOW	1
40	Garlock 08FDU06	BUSHING	4

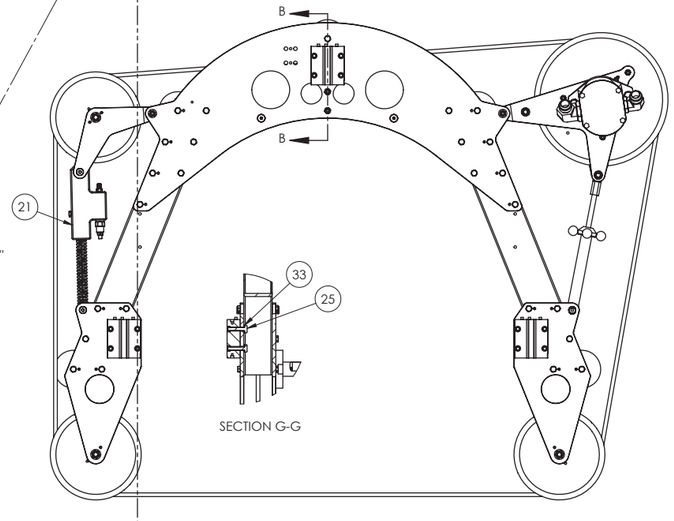


VIEW F-F
SCALE 1 : 4

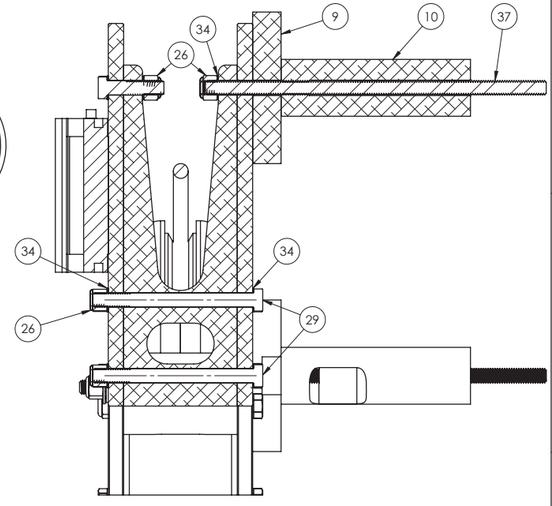




DETAIL E
SCALE 1 : 2



SECTION G-G



SECTION B-B
SCALE 1 : 2

REV.	DESCRIPTION	DATE	APR.
2	RELEASED ROV VERSION	10/14/2014	Karl K
1	PRODUCTION RELEASE	3/21/2011	KarlK

REVISION HISTORY

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E.H. WACHS WORKMANSHIP STANDARDS (WI 17-01) SHALL APPLY TO ALL ITEMS NOT SPECIFIED ON DRAWING.
DO NOT SCALE DRAWING.

TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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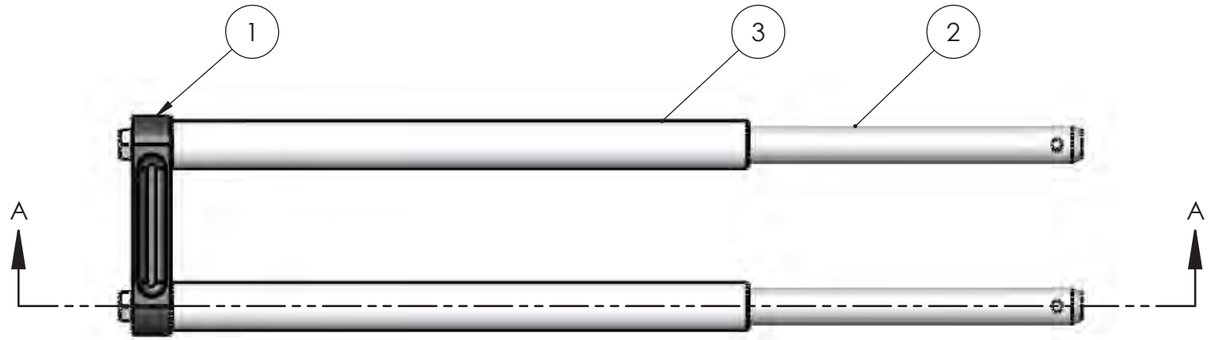
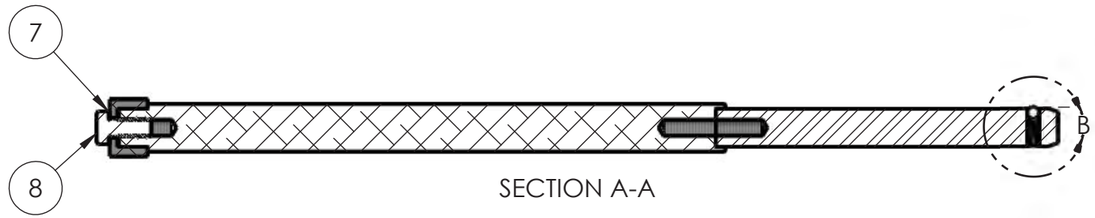
Lincolnshire, IL 60069
www.ehwachs.com

TITLE	DWDWS-3616 BOW
DRAWN BY	AG
APPROVED BY	.
SCALE	1:8
DATE	10/29/09
DATE	.
SHEET	1 OF 1
SIZE	D
DWG. NO.	10-010-36-430-ROV
REV.	2

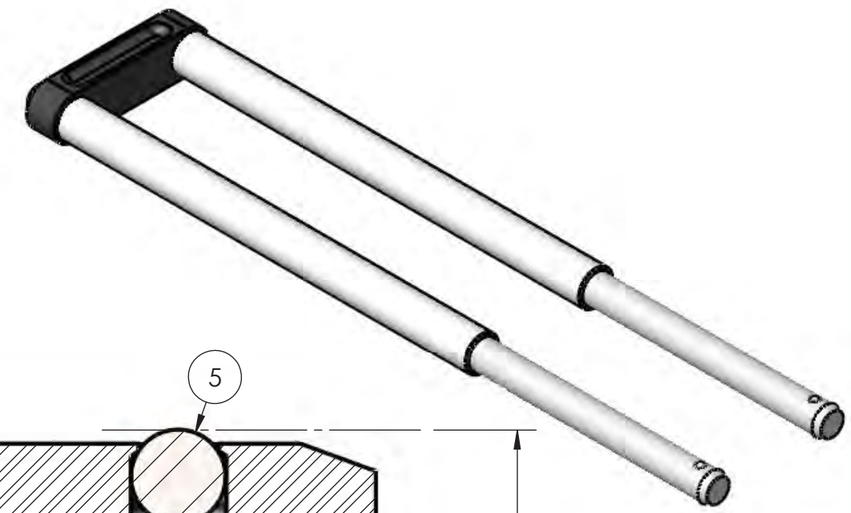
NOTES:
1. MATERIAL:
2. FINISH:

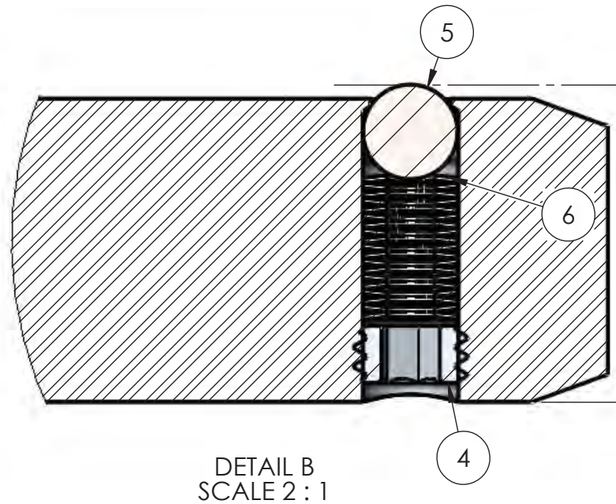
ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	10-010-00-231	BLOCK, 231	1
2	10-010-00-230-ROV	ROD, 36-230 ROV	2
3	10-010-36-318	PIN EXTENSION	2
4	91318A610	SET SCREW, SS	2
5	96415K76	DETENT BALL	2
6	9713K57	DISC SPRING	38
7	98017A209	1/2 WASHER, SS	2
8	92240A713	1/2-13 x 3/4 HHCS SS	2





SECTION A-A





DETAIL B
SCALE 2 : 1

ASSEMBLE BALL, SPRINGS, AND SET SCREW
AS SHOWN USING LOCTITE 277 ON SET SCREW THREAD
ADJUST SET SCREW BEFORE LOCTITE SETS.

REMOVE CLEARANCE OF BALL, SPRINGS, AND ROD
THEN ADD 1/2 TURN MORE OF SET SCREW.

TEST IN A "203" PLATE TO ENSURE PROPER TENSION,
ROD MUST HOLD ITS OWN WEIGHT IN HOLE AND REQUIRE 10-40
POUNDS FORCE TO REMOVE

REV.	DESCRIPTION	DATE	APR.
1	RELEASED FOR PRODUCTION	10/15/2014	Karl K

REVISION HISTORY

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TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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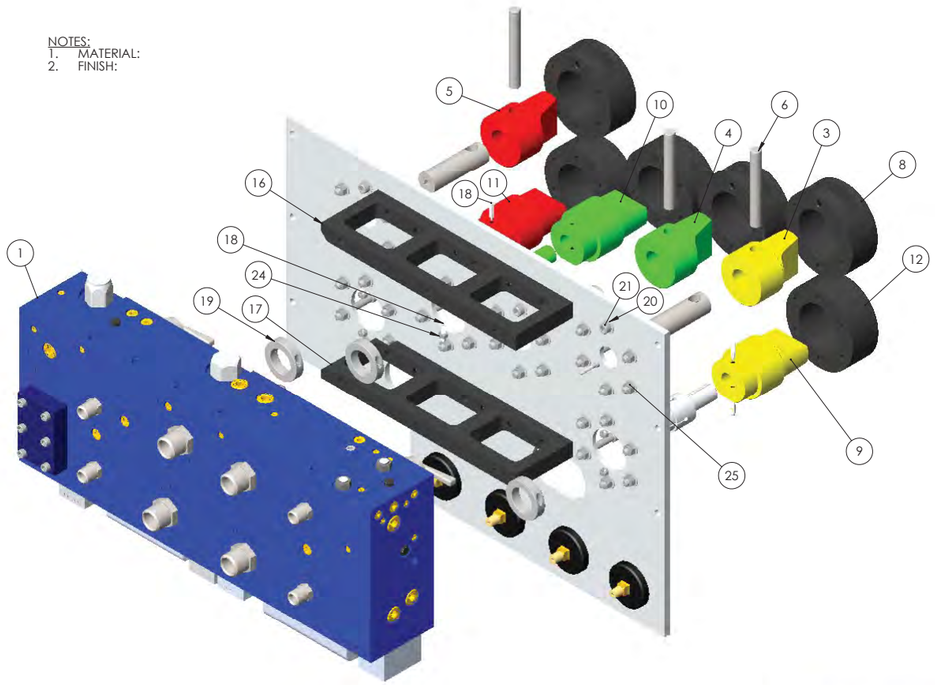
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: CLAMP PIN ASSY, ROV

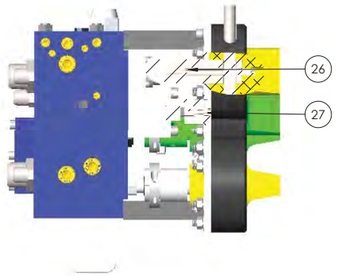
DRAWN BY	APPROVED BY	SCALE
Karl K	.	1:4
DATE: 9/5/2014	DATE	SHEET: 1 OF 1

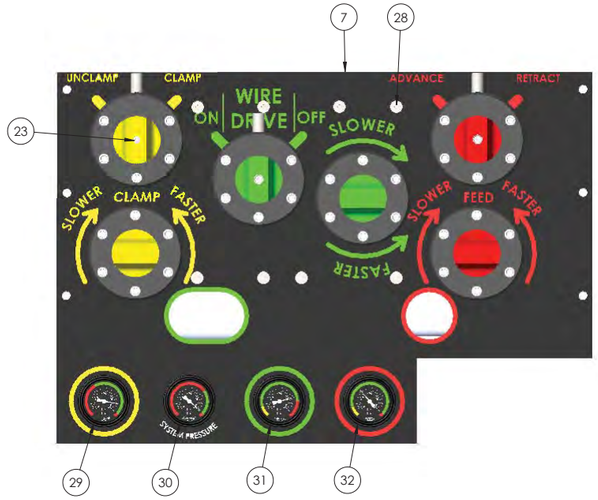
SIZE	DWG. NO.	REV.
B	**10-010-36-443**	1

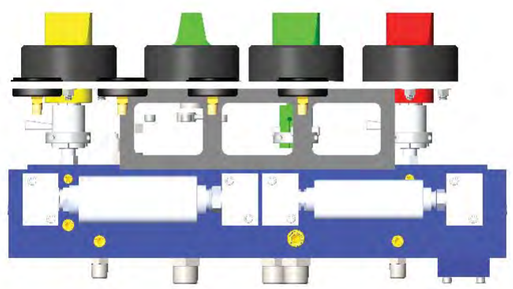
NOTES:
1. MATERIAL:
2. FINISH:

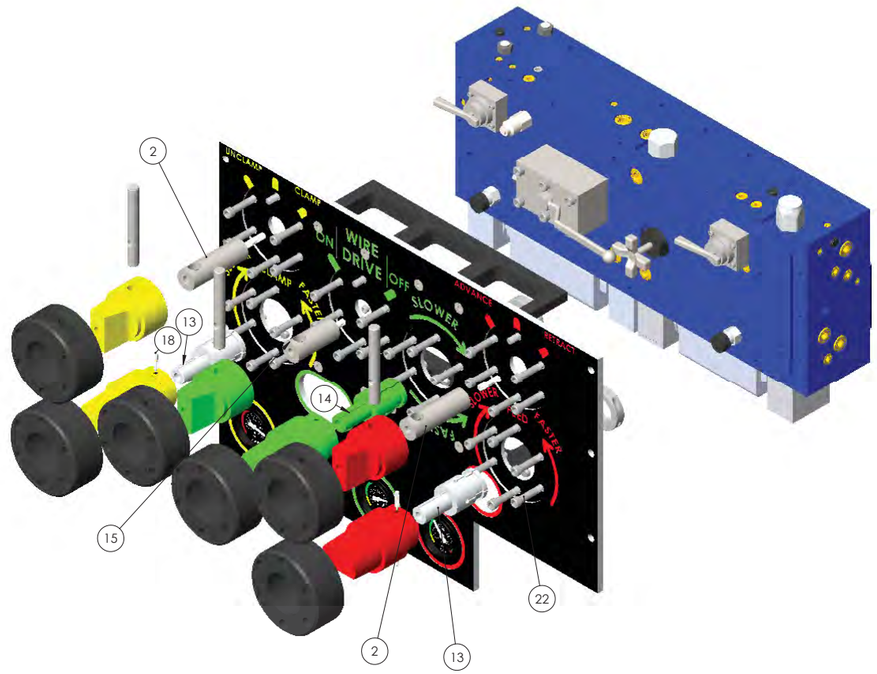


ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	H10-023-000	84HP HPU MANIFOLD ASSEMBLY	1
2	H10-084-101	SHAFT, INTERMEDIATE	2
3	H10-084-102Y	KNOB, ROV	1
4	H10-084-102G	DESCRIPTION	1
5	H10-084-102R	DESCRIPTION	1
6	H10-084-103	PIN, STOP	3
7	H10-084-104-AA	PANEL, ROV INTERFACE	1
8	H10-084-105	HOUSING, KNOB	3
9	H10-084-109Y	DESCRIPTION	1
10	H10-084-109G	DESCRIPTION	1
11	H10-084-109R	DESCRIPTION	1
12	H10-084-111	HOUSING, KNOB	3
13	H10-084-112	SHAFT, CLUTCH	2
14	H10-084-113	SHAFT, CLUTCH	1
15	H10-084-114	SHAFT, INTERMEDIATE	1
16	10-010-00-327A	ROV CONTROL STANDOFF A	1
17	10-010-00-327B	ROV CONTROL STANDOFF B	1
18	8688A152	1/4-20 SPRING PLUNGER	6
19	6436K75	1-1/2" COLLAR	3
20	91950A031	3/8 FLAT WASHER	36
21	92185A624	3/8-16X1", SHCS	3
22	92185A634	3/8-16X2-1/2", SHCS	33
23	92311A628	3/8-16X1-1/2", SET SCREW	3
24	94804A029	1/4-20, HEX NUT	6
25	94804A320	5/16-16, HEX NUT	33
26	92185A186	10-24 x 1-1/8 lg SHCS 316	2
27	92290A326	M6-1.0 x 20mm LG SHCS 316SS	1
28	90585A583	5/16-18 x 1 FHSCS 316SS	8
29	SS_LFP212-3000-1602-G	0-3000 PSI GAUGE, DWDWS CLAMP PRESSURE	1
30	SS_LFP212-3000-1601-G	0-3000 PSI GAUGE, DWDWS SYSTEM PRESSURE	1
31	SS_LFP212-3000-1604-G	0-3000 PSI GAUGE, DWDWS DRIVE PRESSURE	1
32	SS_LFP212-3000-1603-G	0-3000 PSI GAUGE, DWDWS FEED PRESSURE	1









REV.	DESCRIPTION	DATE	APR.
REVISION HISTORY			

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FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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Lincolnshire, IL 60069
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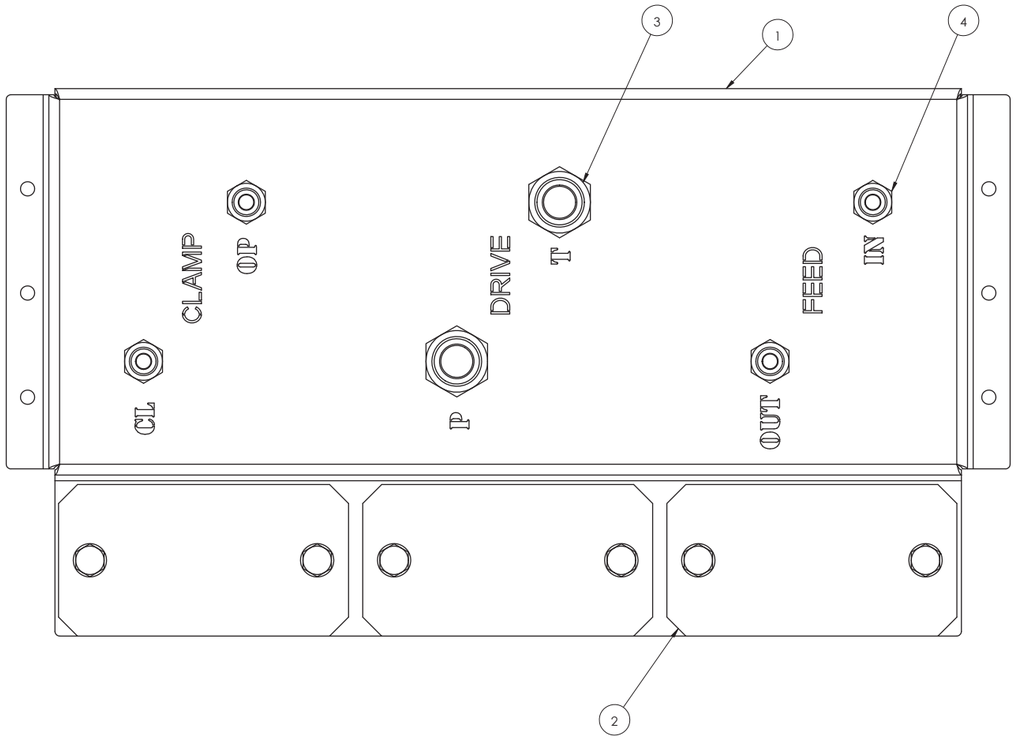
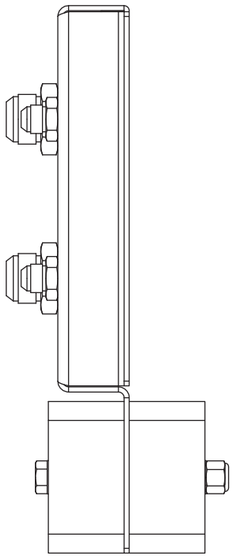
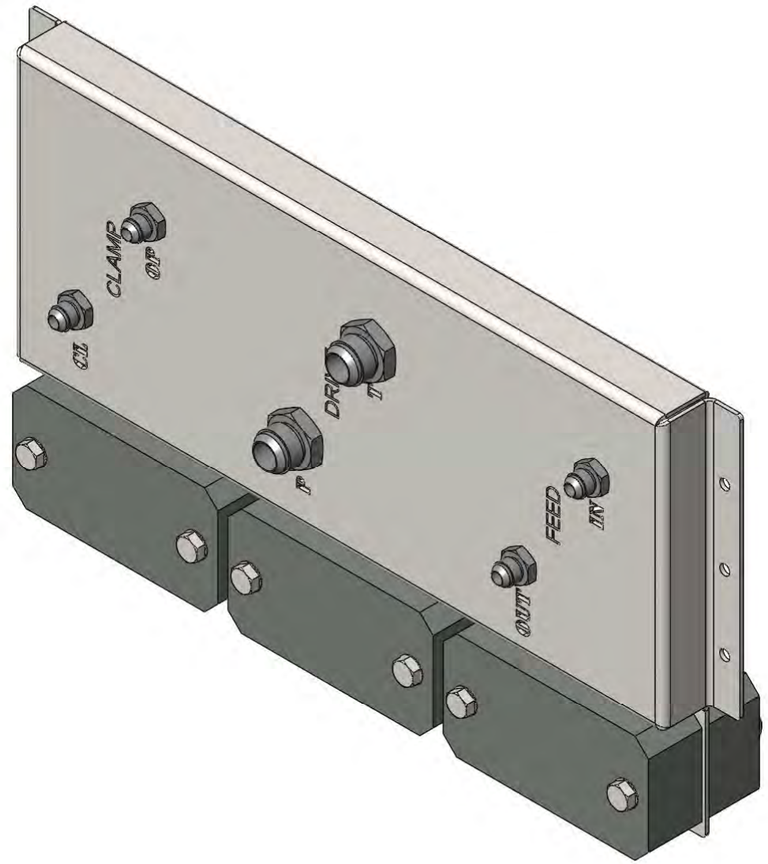
TITLE	ROV INTERFACE PANEL		
DRAWN BY: Drawn by Initials	APPROVED BY: Approved By Initials	SCALE: 1:4	
DATE: Drawn Date	DATE: Approved Date	SHEET: 1 OF 1	
SIZE: D	DWG. NO.: H10-084-200-AA	REV.	

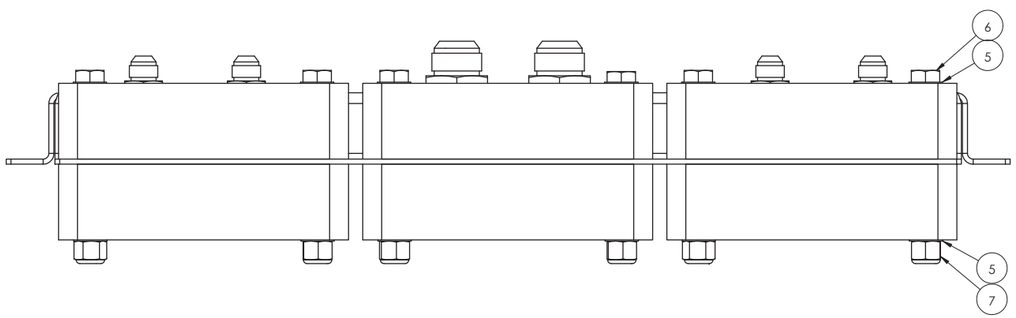
NOTES:
1. MATERIAL:
2. FINISH:

ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	10-010-00-321	ROV SAW BULKHEAD PANEL	1
2	10-010-00-320	2 X4 X 8 LEAD WEIGHT	6
3	16_wtx_SS	PARKER -16 BULKHEAD FITTING	2
4	8_wtx_SS	PARKER-8 BULKHEAD FITTING	4
5	98017A209	1/2 WASHER, SS	12
6	92198A731	1/2-13 x 4-3/4 HHCS SS	6
7	91831A137	LOCKNUT 1/2"-13, SS	6









REV.	DESCRIPTION	DATE	APR.
1	RELEASED FOR PRODUCTION	10/21/2014	Karl K.

REVISION HISTORY

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TWO PLACE DECIMAL ± .010
THREE PLACE DECIMAL ± .005
ANGULAR ± 0.5 MIN.

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Lincolnshire, IL 60069
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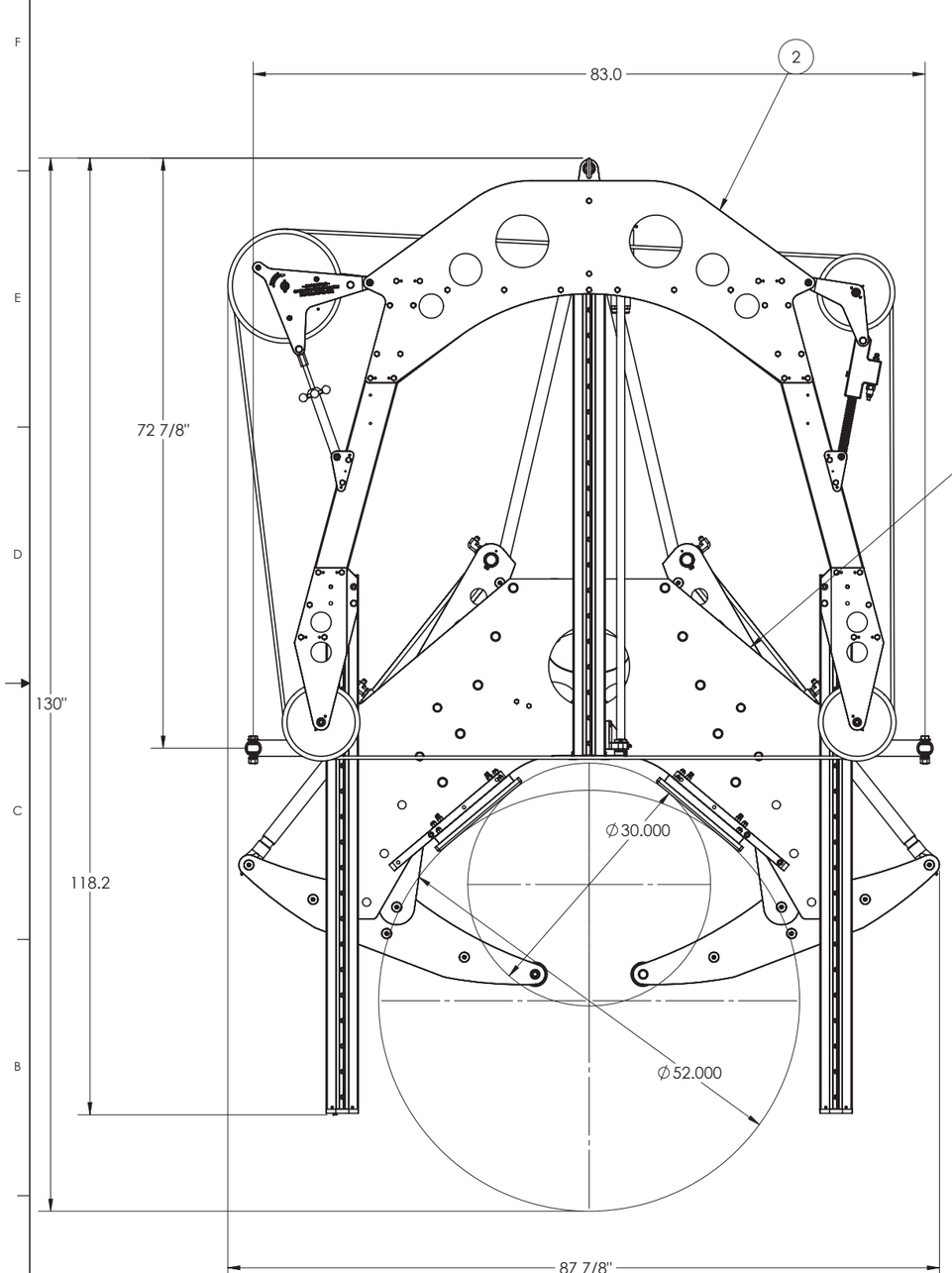
TITLE: DWDWS BULKHEAD ASSEMBLY

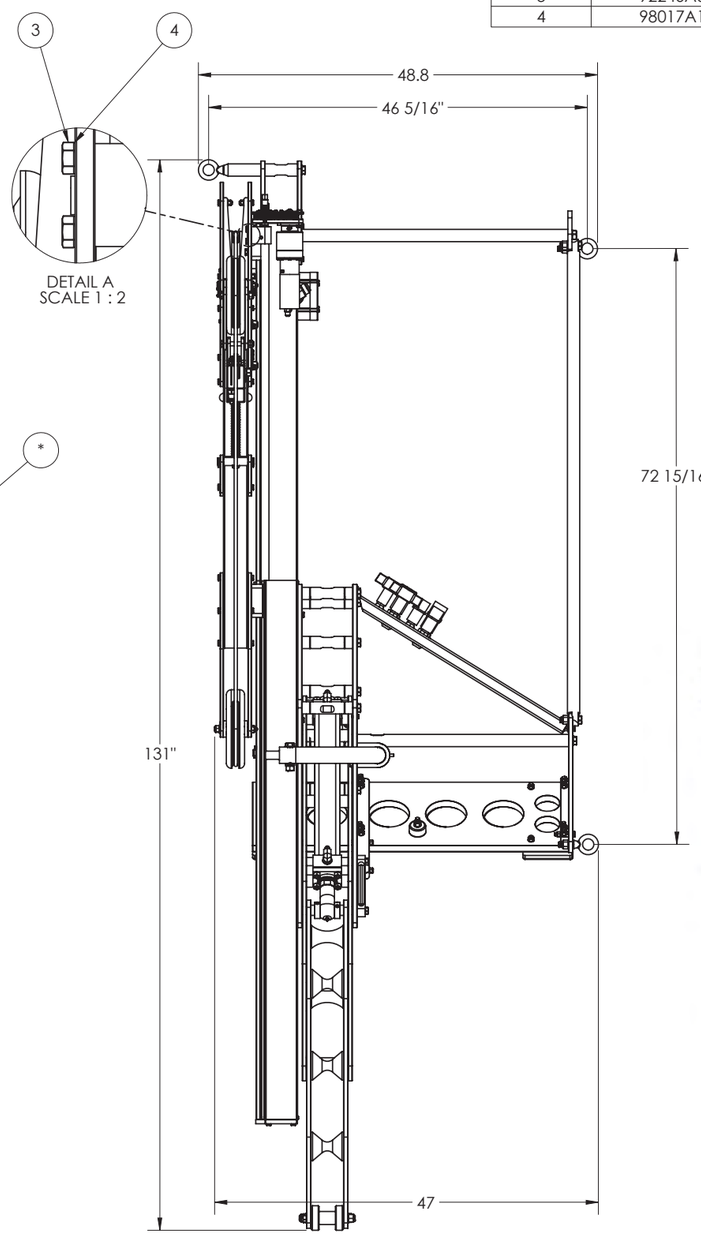
DRAWN BY	APPROVED BY	SCALE
Karl K	.	1:2
DATE: 10/17/2014	DATE	SHEET: 1 OF 1

SIZE	DWG. NO.	REV.
D	10-010-36-322	1

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-52-410-R1	FRAME ASSEMBLY	1
2	10-010-52-430-R1	WS-5230 BOW	1
3	92240A623	HHCS 3/8"-16x7/8" LG,SS	4
4	98017A199	3/8" WASHER, SS	4



CLAMP CLOSED 30 IN POS
SHOWN FOR MAXIMUM
ENVELOPE WIDTH



CLAMP OPEN, 52 IN POS
SHOWN FOR MAXIMUM
ENVELOPE LENGTH

REV.	DESCRIPTION	DATE	APR.
2	UPGRADE TO R1	11/18/2014	Karl K
1	PRODUCTION RELEASE	1/7/2010	AG

REVISION HISTORY

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TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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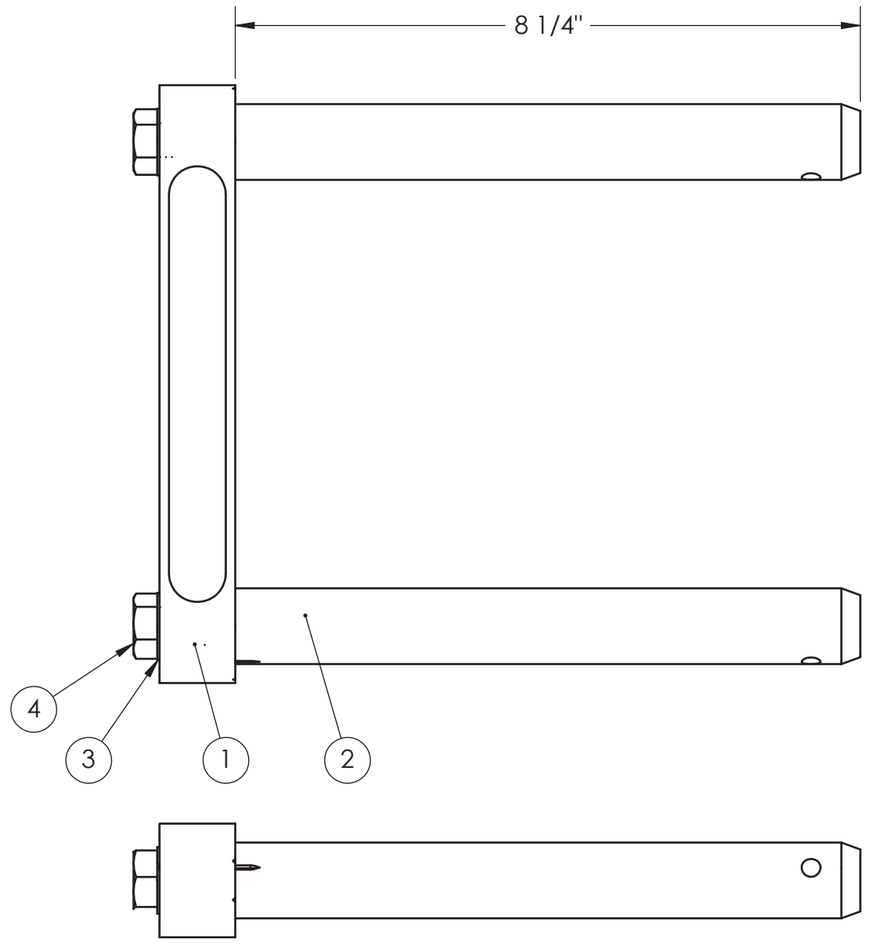
Lincolnshire, IL 60069
www.ehwachs.com

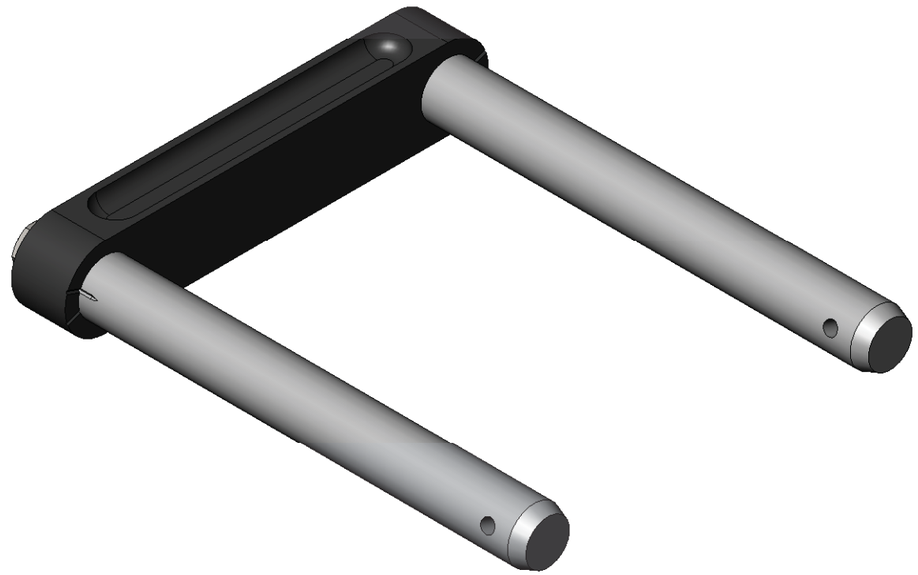
TITLE: WS 5230 GENERAL ARRANGEMENT

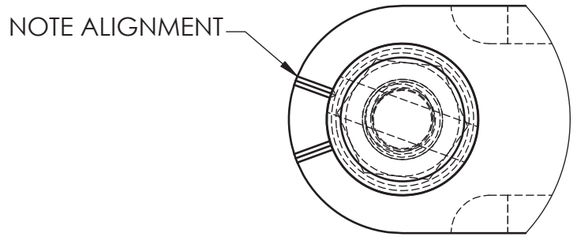
DRAWN BY	APPROVED BY	SCALE
AG	.	1:12
DATE	DATE	SHEET
1/7/2010	.	1 OF 1

SIZE	DWG. NO.	REV.
C	10-010-552-R1	2

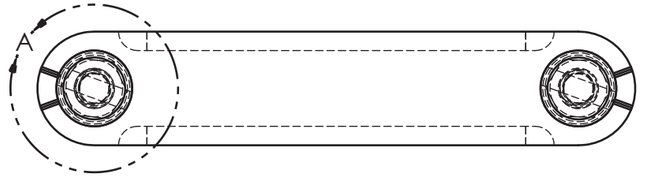
ITEM	PART NUMBER	DESCRIPTION	QTY.
1	10-010-52-231	BLOCK, 231	1
2	10-010-00-230	ROD, 230	2
3	98017A209	1/2 WASHER, SS	2
4	92240A713	1/2-13 x 3/4 HHCS SS	2







DETAIL A
SCALE 1 : 1



REV.	DESCRIPTION	DATE	APR.
2	CHANGED FINISH	11/6/2014	Karl K
1	RELEASED	9/24/2010	MWG

REVISION HISTORY

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FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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Lincolnshire, IL 60069
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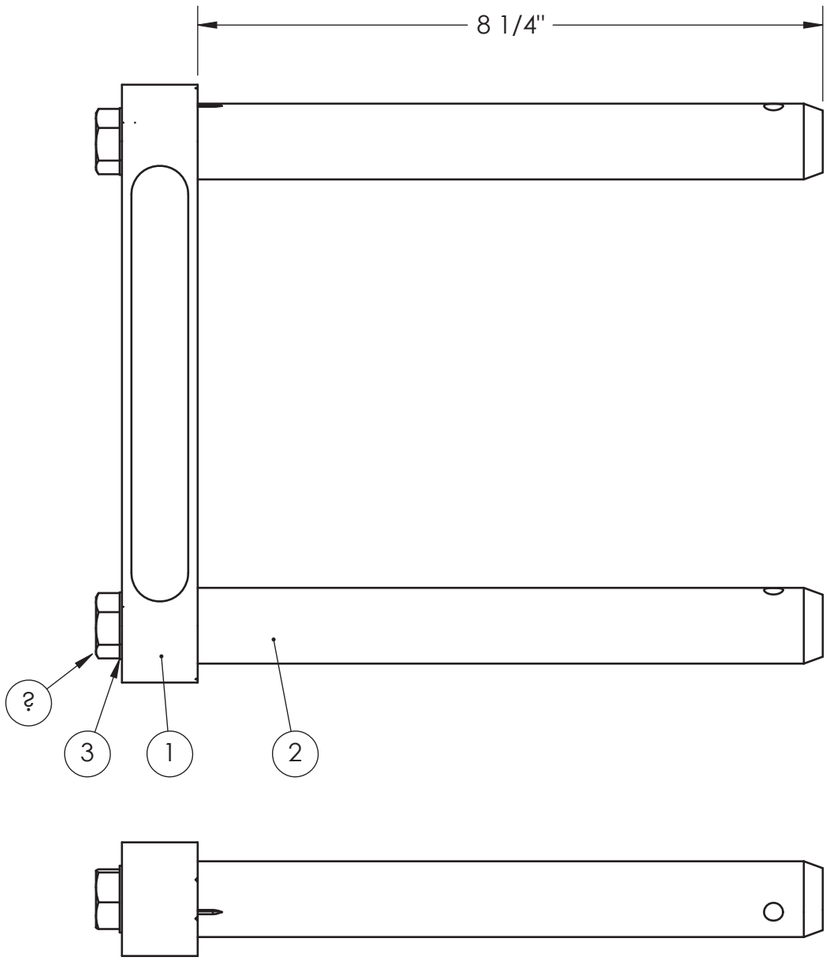
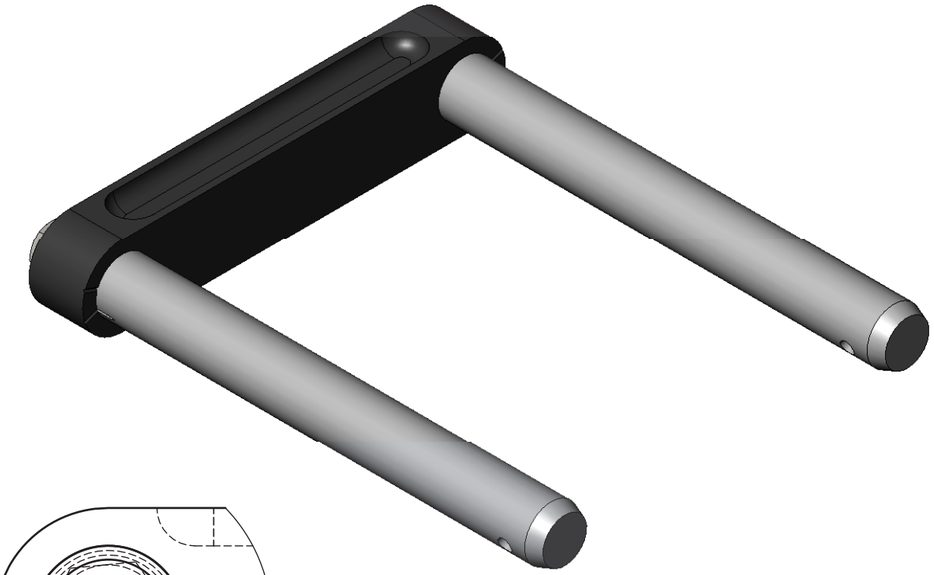
TITLE: FORK, LH

DRAWN BY	APPROVED BY	SCALE
MWG	KRP	1:2
DATE: 9-24-10	DATE: 9-24-10	SHEET: 1 OF 1

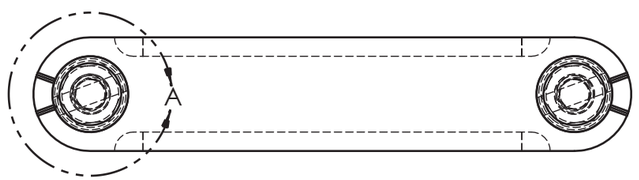
SIZE	DWG. NO.	REV.
B	**10-010-52-110-LH**	2

ITEM	PART NUMBER	DESCRIPTION	QTY.
1	10-010-52-231	BLOCK, 231	1
2	10-010-00-230	ROD, 230	2
3	98017A209	1/2 WASHER, SS	2
4	92240A713	1/2-13 x 3/4 HHCS SS	2





DETAIL A
SCALE 1 : 1



REV.	DESCRIPTION	DATE	APR.
2	CHANGED FINISH	11/6/2014	Karl K
1	RELEASED	9/24/2010	MWG

REVISION HISTORY

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FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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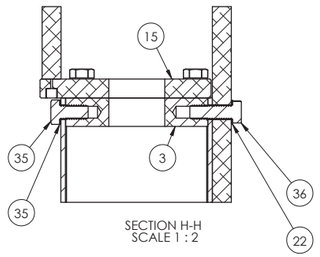
TITLE: FORK, RH

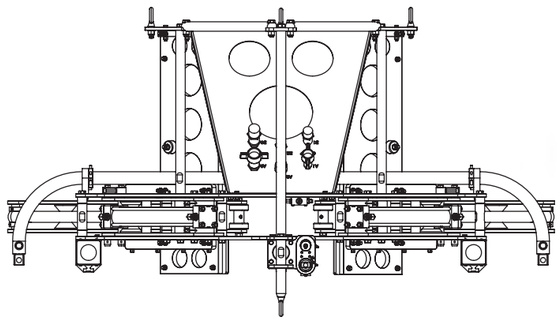
DRAWN BY	APPROVED BY	SCALE
MWG	KRP	1:2
DATE	DATE	SHEET
9-24-10	9-24-10	1 OF 1

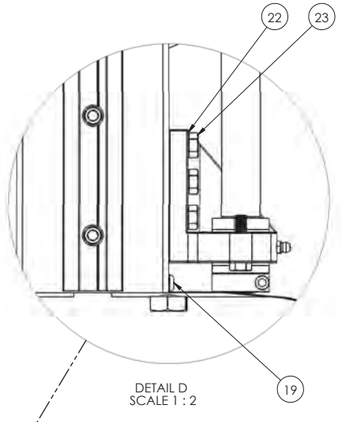
SIZE	DWG. NO.	REV.
B	**10-010-52-110-RH**	2

ITEM NO.	PART NUMBER	DESCRIPTION	Default/QTY.
1	10-010-00-027	PLATE, 027	3
2	10-010-00-027B	PLATE, 027B	2
3	10-010-00-028	PLATE, 028	1
4	10-010-00-029	PLATE, 029	2
5	10-010-00-243-R1	PLATE, 243-R1	1
6	10-010-00-251	ROD, 251	1
7	10-010-52-020	TUBE, LINEAR GUIDE MOUNTING	2
8	10-010-52-021	TUBE, LINEAR GUIDE MOUNTING	1
9	10-010-52-023	TAPPED RAIL	3
10	10-010-52-001	LINEAR GUIDE RAIL	3
11	10-010-52-242	ROD, 242	1
12	10-010-52-246-R1	PLATE, 246	1
13	10-010-52-246B-R1	PLATE, 246B	1
14	10-010-52-247	BAR, LIFTING	2
15	10-010-52-411-R1	FRAME FEED	1
16	10-010-52-420-R1	CLAMP, 52"-30" PIPE RANGE	1
17	3014T867	EYEBOLT	4
18	92196A585	SHCS 5/16"-18x1.25"LG, SS	64
19	92949A537	BSHCS 1/4"-20x1/2"LG, SS	20
20	98017A655	1/4" WASHER, SS	16
21	92240A546	HHCS 1/4"-20x1.5"LG, SS	8
22	98017A199	3/8" WASHER, SS	64
23	92240A626	HHCS 3/8"-16x1.5"LG, SS	26
24	91831A127	LOCKNUT 3/8"-16, SS	32
25	90145A539	1/4 x 5/8 LG. DOWEL PIN	2
26	98017A215	5/8 WASHER, SS	14
27	90715A185	LOCKNUT 5/8"-11.SS	7
28	92198A803	HHCS 5/8"-11 x 2.25" LG, SS	4
29	92240A798	HHCS 5/8"-11 x 1.5"LG, SS	3
30	92210A626	FSHCS 3/8"-16x1.25"LG,SS	8
31	92240A839	HHCS 3/4"-10 x 1.5"LG, SS	2
32	98017A220	3/4" WASHER, SS	2
33	91831A029	LOCKNUT 1/4"-20, SS	8
34	92196A539	SHCS 1/4"-20 x 5/8" LG, SS	4
35	92240A622	HHSC 3/8"-16 x 3/4" LG, SS	2
36	92240A625	HHCS 3/8"-16x 1-1/8"LG, SS	4

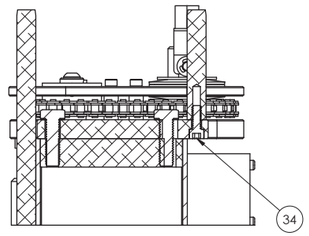


SECTION H-H
SCALE 1 : 2

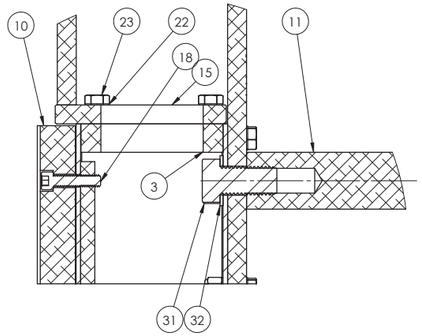




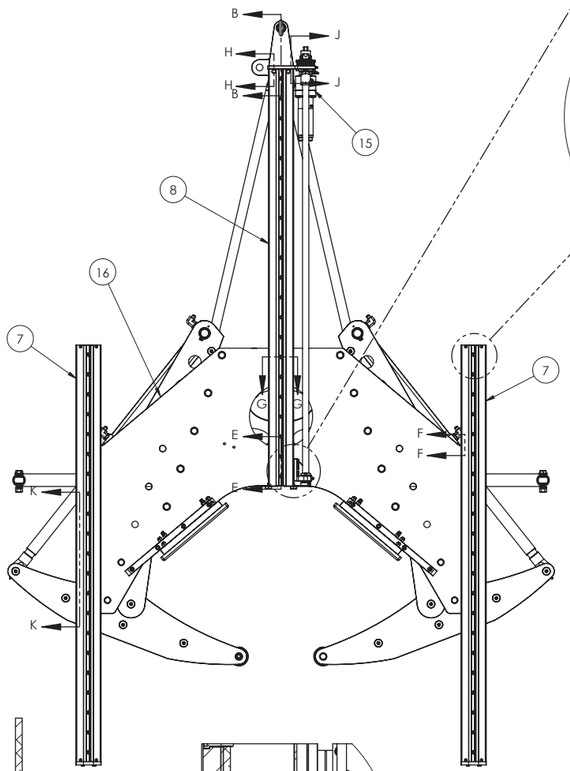
DETAIL D
SCALE 1 : 2

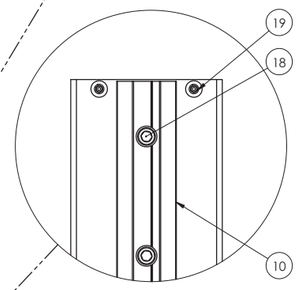


SECTION J-J
SCALE 1 : 2

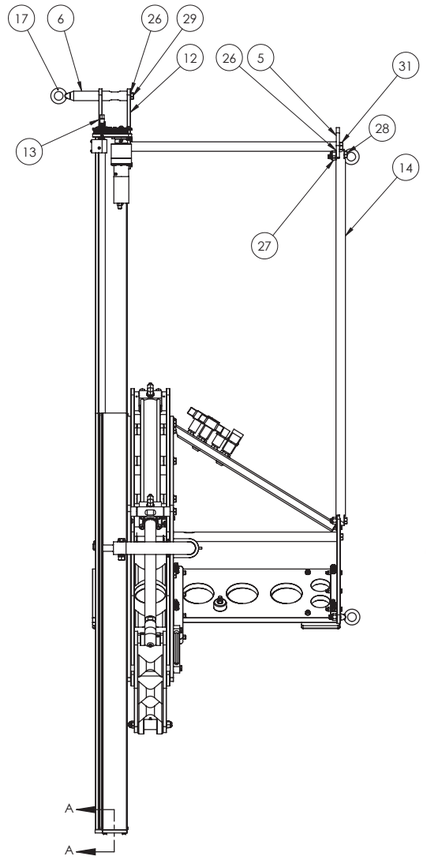


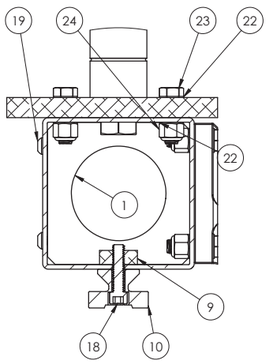
SECTION B-B
SCALE 1 : 2



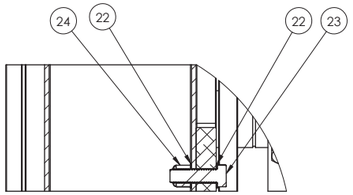


DETAIL C
SCALE 1 : 2

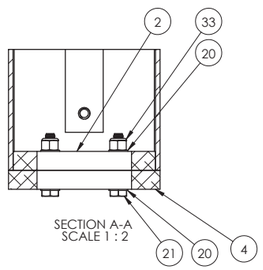




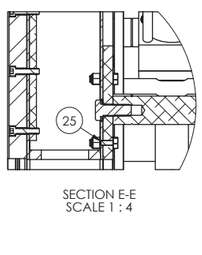
SECTION G-G
SCALE 1 : 2



SECTION F-F
SCALE 1 : 2



SECTION A-A
SCALE 1 : 2



SECTION K-K
SCALE 1 : 6

SECTION E-E
SCALE 1 : 4

REV.	DESCRIPTION	DATE	APR.
3	UPGRADE TO R1	11/12/2014	Karl K.
2	ADDED TAPPED RAIL	8/6/2010	JPW
1	PRODUCTION RELEASE	1/7/2010	AG

REVISION HISTORY

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TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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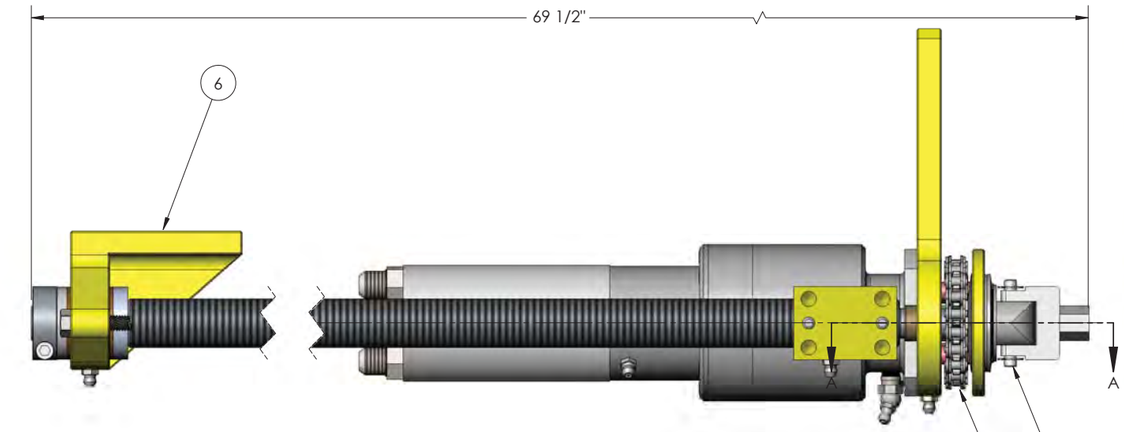
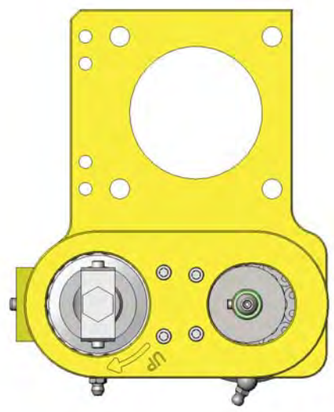
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: FRAME ASSEMBLY

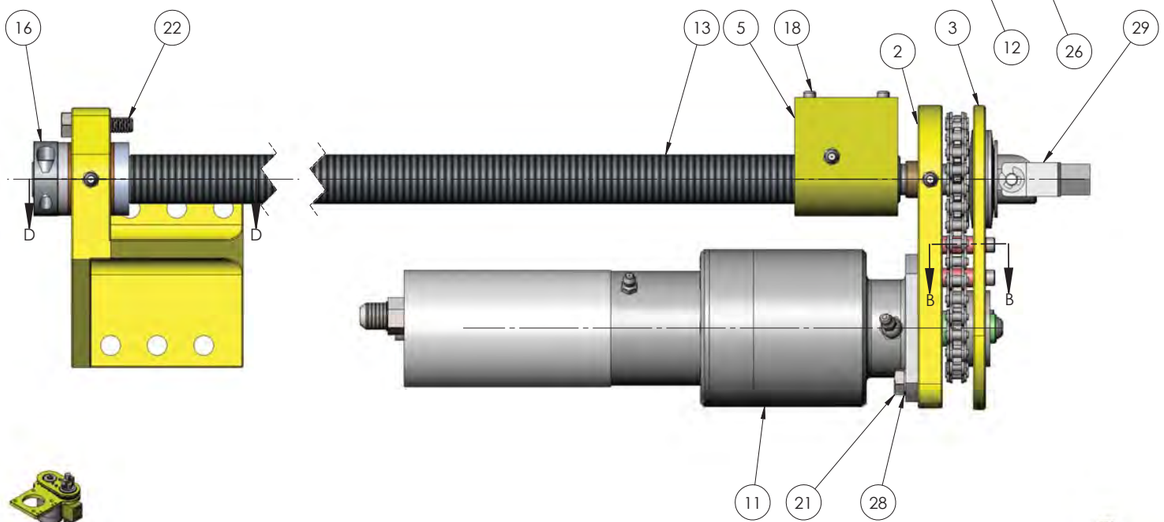
DRAWN BY	APPROVED BY	SCALE
AG	-	1:12
DATE	DATE	SHEET
1/7/2010	-	1 OF 1

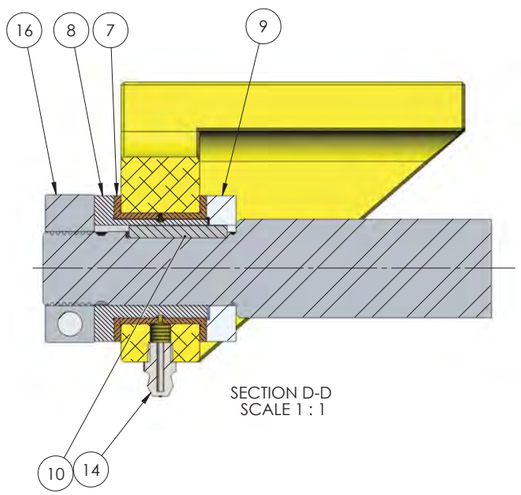
SIZE	DWG. NO.	REV.
D	10-010-52-410-R1	3



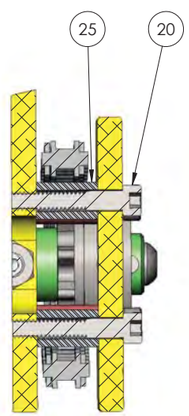


ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-019	KEY	1
2	10-010-00-041-R1	PLATE, 041-R1	1
3	10-010-00-042-R1	PLATE, 042-R1	1
4	10-010-00-043	BUSHING, FEED	1
5	10-010-00-044	NUT, FEED	1
6	10-010-00-045-R1	BLOCK, FEED SCREW MOUNTING	1
7	10-010-00-046	BUSHING, FEED	2
8	10-010-00-047	RETAINER, FEED SCREW	1
9	10-010-00-048	WASHER, 048	1
10	10-010-00-049	KEY	1
11	10-010-00-412-R1	PLANETARY GEAR MOTOR	1
12	10-010-00-CHAIN	ROLLER CHAIN #35-SS	1
13	10-010-52-040	SCREW, FEED	1
14	1293K21	1/4-28 GREASE FITTING; SS	3
15	19-019-00	WASHER, HARDENED THRUST	1
16	6438K56	CLAMP-ON SHAFT COLLAR	1
17	90-056-10	PIN, 1/4 X 1.00 DOWEL	1
18	90145A539	1/4 x 5/8 LG. DOWEL PIN	2
19	91847A029	JAM NUT 1/4"-20, SS	1
20	92185A249	SHCS #10-24 x 1.25" LG	4
21	92240A581	HHCS 5/16"-18 x 3/4" LG	1
22	92240A585	HHCS 5/16"-18 x 1.25" LG	1
23	92311A534	CUP POINT SET SCREW 1/4"-20 x 5/16" LG	2
24	92311A541	SET SCREW 1/4"-20 x 7/8" LG, SS	1
25	92320A231	STANDOFF	4
26	9389A580	CLEVIS PIN	1
27	9713K94	DISC, CLUTCH	4
28	98017A689	5/16" WASHER, SS	1
29	P06-052-160	YOKE	1
30	P06-052-161	BUSHING, FEED CLUTCH	1
31	P06-052-181	SPROCKET FOR #35 CHAIN, 20T,3/8 PITCH	1
32	P06-052-182	SPROCKET FOR #35 CHAIN, 15T, 3/8 PITCH	1

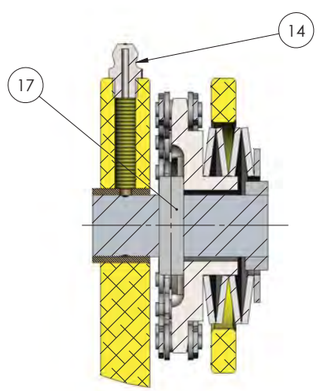




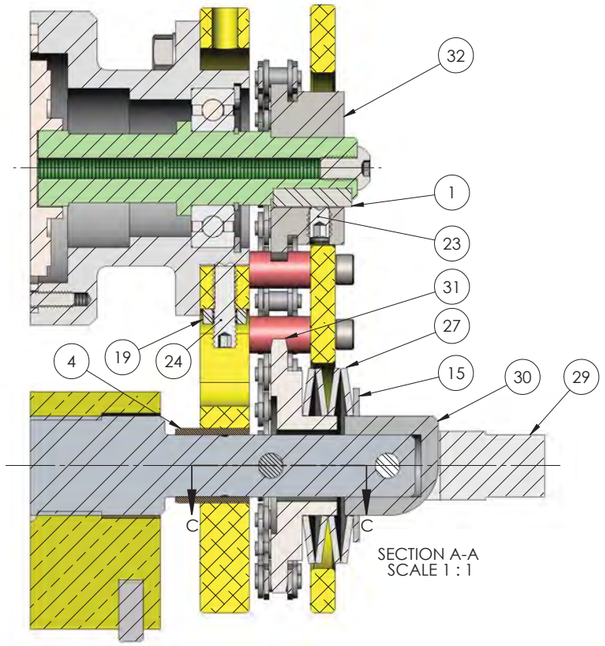
SECTION D-D
SCALE 1 : 1



SECTION B-B
SCALE 1 : 1



SECTION C-C
SCALE 1 : 1



SECTION A-A
SCALE 1 : 1

REV.	DESCRIPTION	DATE	APR.
2	UPGRADE TO R1	11/12/2014	Karl K
1	PRODUCTION RELEASE	11/12/2009	KRP

REVISION HISTORY

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TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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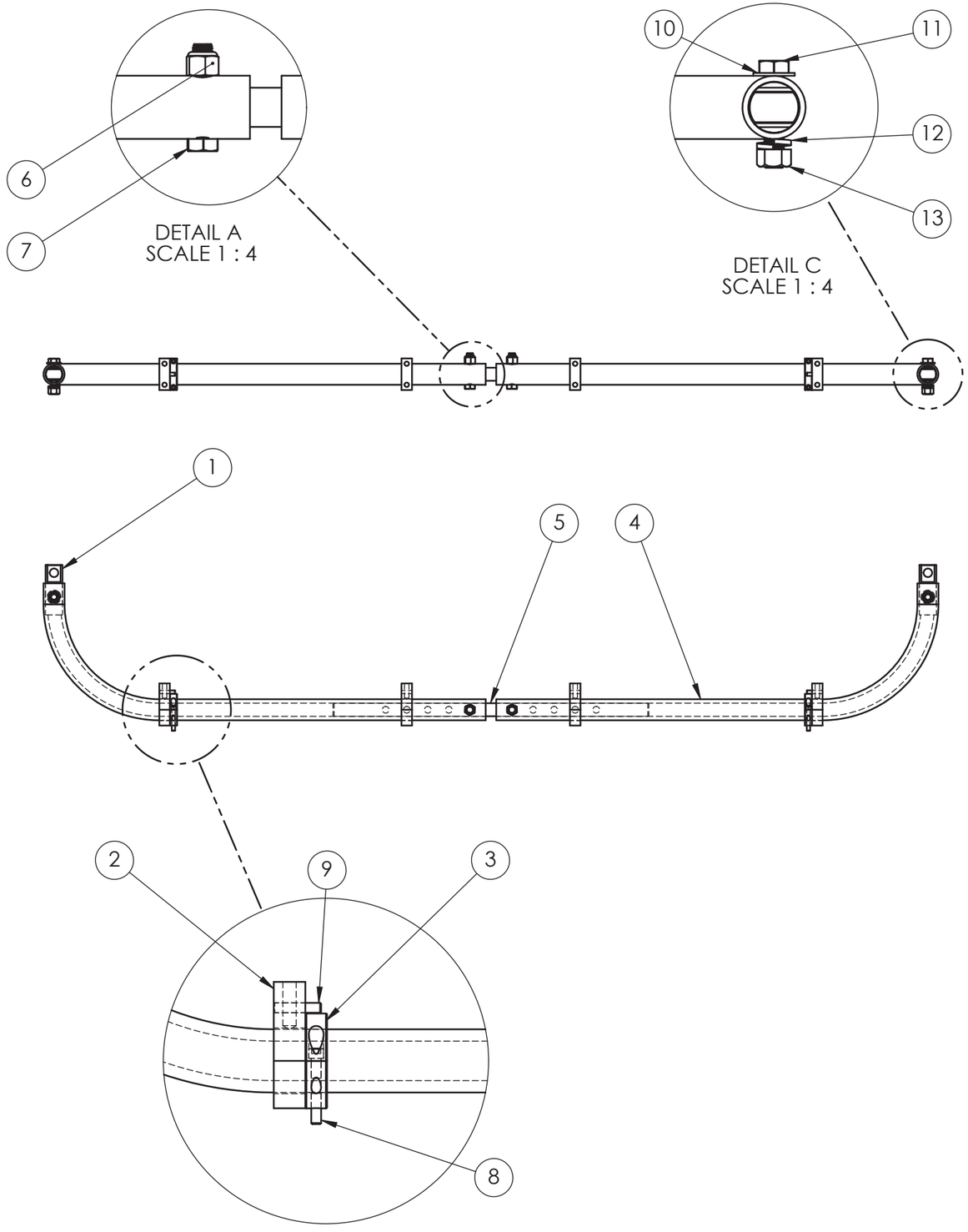
Lincolnshire, IL 60069
www.ehwachs.com

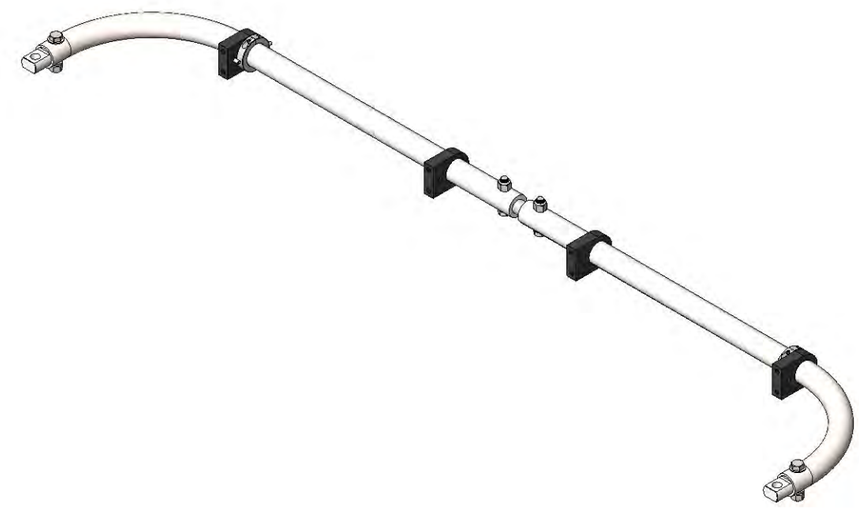
TITLE: FRAME FEED

DRAWN BY	APPROVED BY	SCALE
AG	.	1:2
DATE	DATE	SHEET
10/26/09	.	1 OF 1

SIZE	DWG. NO.	REV.
C	10-010-52-411-R1	2



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-252-R1	LIFTING PLUG	2
2	10-010-00-253	PLATE, 253	4
3	10-010-00-254	COLLAR	2
4	10-010-52-250	TUBE, LIFTING	2
5	10-010-52-255	BAR, LIFTING	1
6	91831A144	LOCKNUT 5/8"-11,SS	2
7	92198A806	HHCS 5/8"-11x3" LG, SS	2
8	90145A583	5/16 X 1"LG DOWEL PIN	2
9	90145A587	5/16 X 1-1/2"LG DOWEL PIN	2
10	98180A160	Ult-Coat Gr 8 SAE Fl Wash 5/8"	2
11	91286A410	Gr 8 Coated Alloy HHCS 5/8"-11	2
12	92147A035	Galv Lock Washer 5/8" 1.08" OD,	2
13	93827A253	Ult-Coat Gr 8l Hex Nut 5/8"-11	2



REV.	DESCRIPTION	DATE	APR.
4	UPGRADE TO R-1	11/10/2014	Karl K
3	ADDED (2) 10-010-00-253	8/27/2010	AG
2	REVISED BOM	8/5/2010	JPW
1	PRODUCTION RELEASE	1/6/2010	AG

REVISION HISTORY

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TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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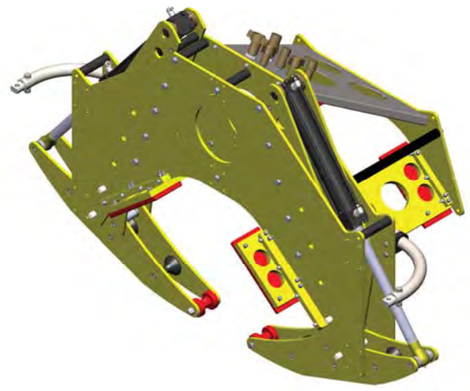
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: LIFTING TUBE

DRAWN BY	APPROVED BY	SCALE
AG	.	1:12
DATE	DATE	SHEET
1/6/10	.	1 OF 1

SIZE	DWG. NO.	REV.
B	**10-010-52-413-R1**	4

ITEM NO.	PART NUMBER	DESCRIPTION	Default/QTY.
1	10-010-00-209-R1	ROD,209-R1	14
2	10-010-00-419B	Flow Divider Combiner Valve Assembly	1
3	10-010-36-211-R1	BAR, 211-R1	2
4	10-010-36-221	SHOE,221	4
5	10-010-52-110-LH	FORK, LH	1
6	10-010-52-110-RH	FORK, RH	1
7	10-010-52-203-R1	PLATE, 203	1
8	10-010-52-203B-R1	PLATE, 203B	1
9	10-010-52-214-R1	BAR, 214	4
10	10-010-52-220-R1	PLATE, 220	2
11	10-010-52-222-R1	PLATE, 222	1
12	10-010-52-223	ROD, 223	2
13	10-010-52-224B	WELDMENT, BULKHEAD PLATE	1
14	10-010-52-413-R1	LIFTING TUBE	1
15	10-010-52-421-R1	ADJUSTABLE CLAMP WITH ACTUATOR	2
16	3609K2	ZINC ANODE	2
17	90101A230	NUT, NYLOCK JAM 1/4-20	2
18	91831A127	LOCKNUT 3/8"-16, SS	29
19	91831A133	HEX LOCKNUT 7/16"-14, SS	32
20	91831A137	LOCKNUT 1/2"-13, SS	2
21	92186A677	HHCS, 7/16-14 X 2" (316 SS)	8
22	92186A681	HHCS, 7/16-14 X 3" (316 SS)	24
23	92198A633	HHCS 3/8"-16 x 2.25" LG, SS	6
24	92198A634	HHCS 3/8"-16 x 2.5" LG, SS	12
25	92198A752	HHCS, 1/2"-13 X 3-1/4" LNG., SS	2
26	92210A634	FSHCS 3/8"-16 x 2.5" LG, SS	4
27	92240A626	HHCS 3/8"-16x1.5"LG, SS	7
28	92240A714	HHCS 1/2"-13 x 1.25" LG	8
29	92240A798	HHCS 5/8"-11 x 1.5"LG, SS	26
30	92949A550	BHCS, 1/4-20 x 2" LNG.	2
31	95412A804	5/8-11 x 1.5" LG. STUD	2
32	98017A199	3/8" WASHER, SS	54
33	98017A204	7/16 WASHER,SS	64
34	98017A209	1/2 WASHER, SS	12
35	98017A215	5/8 WASHER, SS	26
36	98017A655	1/4" WASHER, SS	2
37	PARKER 6105-08	QUICK CONNECT, 1/2" MALE	2
38	PARKER 6105-16	QUICK CONNECT, 1" MALE	1
39	PARKER 6125-08	QUICK CONNECT, 1/2" FEMALE	2
40	PARKER 6125-16	QUICK CONNECT, 1" FEMALE	1



REV.	DESCRIPTION	DATE	APR.
2	UPGRADE TO R1	11/11/2014	Karl K
1	PRODUCTION RELEASE	1/6/2010	AG

REVISION HISTORY

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ONE PLACE DECIMAL ±.015
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THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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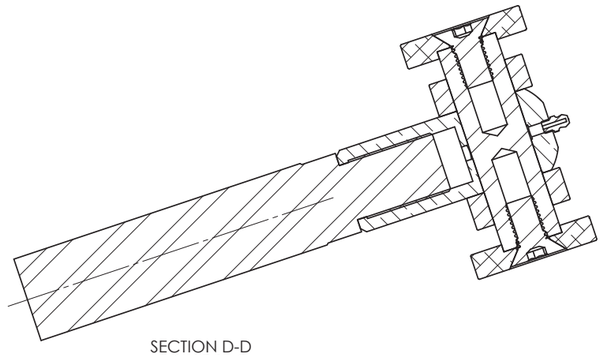
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: CLAMP, 52"-30" PIPE RANGE

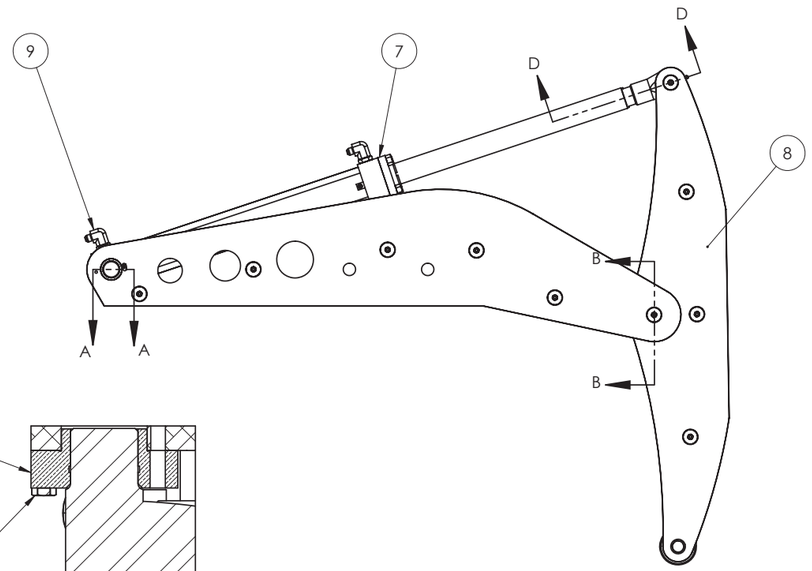
DRAWN BY	APPROVED BY	SCALE
AG	.	1:12
DATE: 1/06/10	DATE: .	SHEET: 1 OF 1

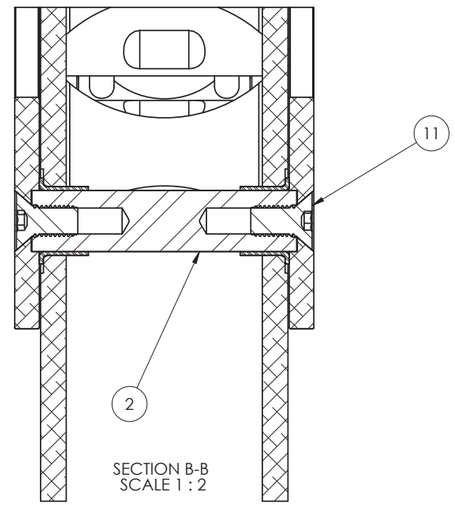
SIZE: D | DWG. NO: 10-010-52-420-R1 | REV: 2

ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	10-010-00-205-R1	BUSHING, CYLINDER	2
2	10-010-00-207	ROD,207	1
3	10-010-00-215	ROD, 215	3
4	10-010-00-213	SPACER, 213	2
5	10-010-52-202-R1	PLATE, 202	1
6	10-010-52-202B-R1	PLATE, 202B	1
7	10-010-52-248	HYDRAULIC CYLINDER	1
8	10-010-52-422-R1	CLAMPING ARM	1
9	Parker 6-10_c5OX-S	ORB-JIC ELBOW	2
10	92198A544	HHCS 1/4"-20 x 1.25" LG	2
11	92210A796	FHCS 5/8"-11x 1.25" LG.	12

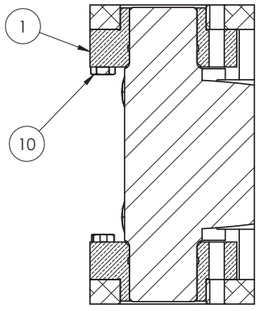


SECTION D-D
SCALE 1 : 2

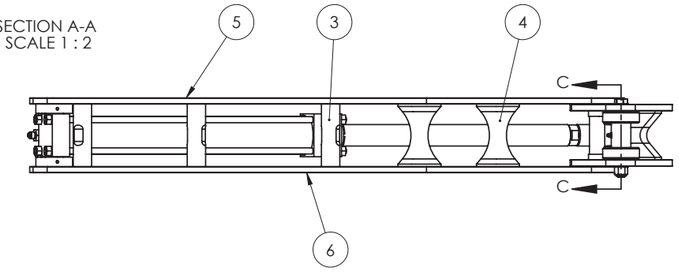


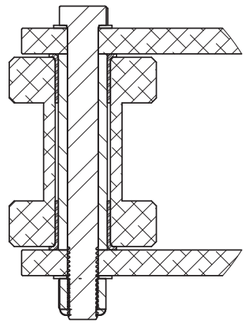


SECTION B-B
SCALE 1 : 2



SECTION A-A
SCALE 1 : 2





SECTION C-C
SCALE 1 : 2

REV.	DESCRIPTION	DATE	APR.
2	UPGRADE TO R1	11/10/2014	Karl K
1	PRODUCTION RELEASE	11/12/2009	AG

REVISION HISTORY

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TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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Lincolnshire, IL 60069
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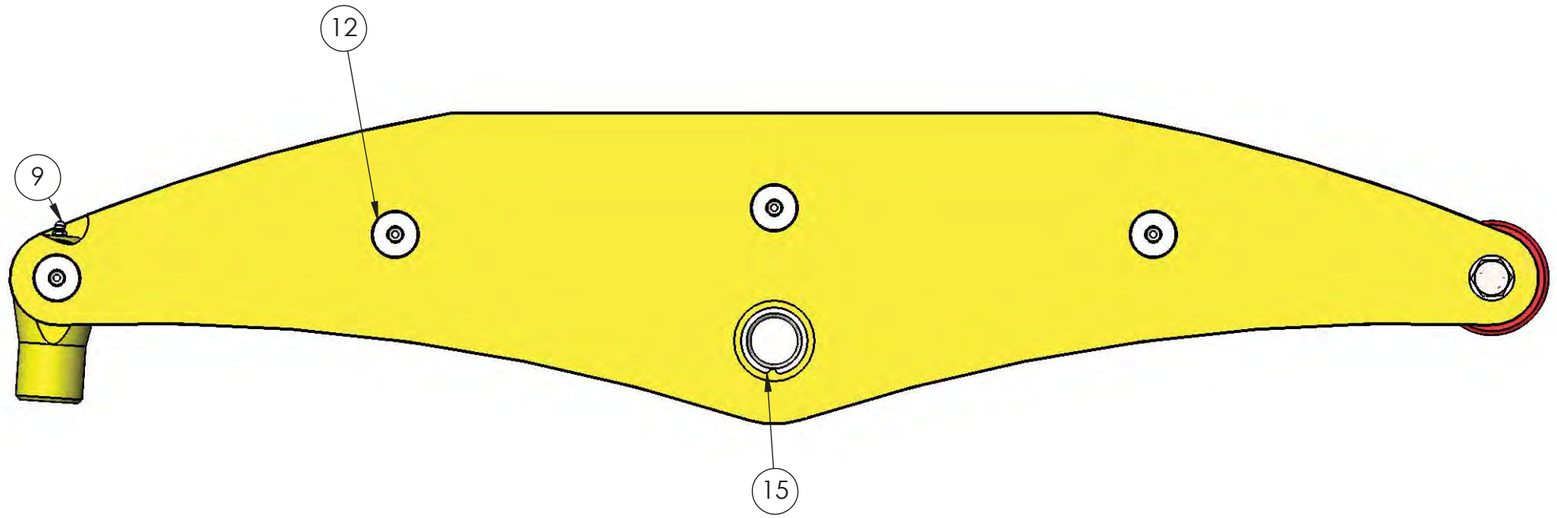
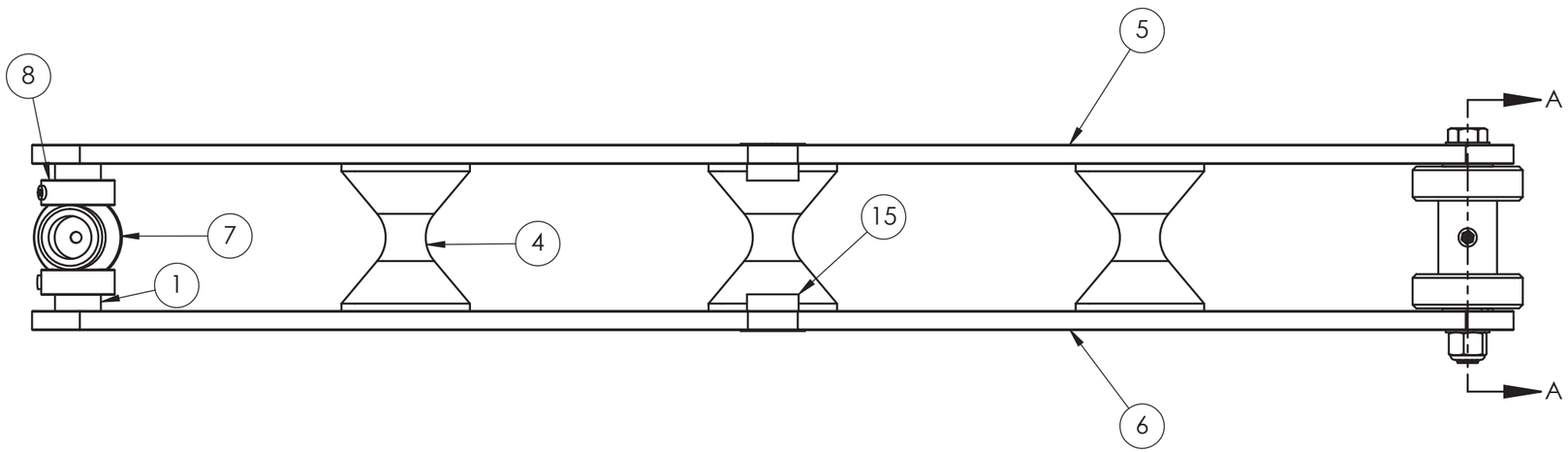
TITLE: ADJUSTABLE CLAMP WITH ACTUATOR

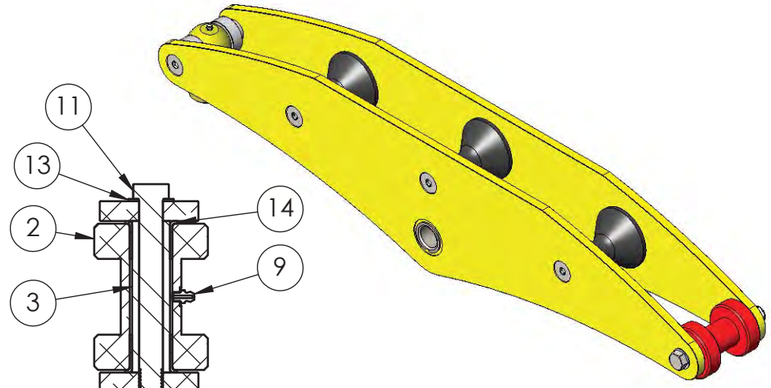
DRAWN BY	APPROVED BY	SCALE
AG	.	1:8
DATE	DATE	SHEET
10/19/09	.	1 OF 1

SIZE	DWG. NO.	REV.
C	10-010-52-421-R1	2



ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	10-010-00-206	ROD, 206	1
2	10-010-00-208	ROLLER	1
3	10-010-00-210	TUBE, 210	1
4	10-010-00-212	SPACER, 212	3
5	10-010-52-201-R1	PLATE, 201	1
6	10-010-52-201B-R1	PLATE, 201B	1
7	10-010-52-204	ROD END, CYLINDER	1
8	6432K29	SHAFT COLLAR	2
9	1293K21	1/4-28 TAPERED GREASE FITTING; SS	2
10	90715A185	LOCKNUT 5/8"-11,SS	1
11	92186A818	5/8-11 X 6 LG HHCS 316SS	1
12	92210A796	FHCS 5/8"-11x 1.25" LG.	8
13	98017A215	5/8 WASHER, SS	2
14	Garlock 16FDU16	BUSHING	2
15	Garlock 20FDU16	BUSHING	2





SECTION A-A

REV.	DESCRIPTION	DATE	APR.
1	RELEASED FOR PRODUCTION	11/10/2014	Karl K

REVISION HISTORY

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TOLERANCES:
FRACTIONS ±1/32
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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E.H. WACHS
600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

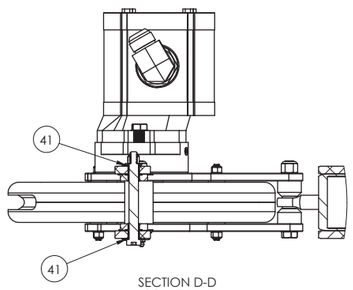
TITLE: CLAMPING ARM

DRAWN BY	APPROVED BY	SCALE
Karl K	Karl K	1:4
DATE	DATE	SHEET
11/10/2014		1 OF 1

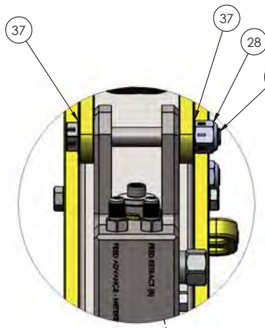
SIZE	DWG. NO.	REV.
B	**10-010-52-422-R1**	1

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-00-001	HYDRAULIC MOTOR	1
2	10-010-00-003	LINEAR BEARING	3
3	10-010-00-010	TENSION KNOB	1
4	10-010-00-023	ROD, 023	1
5	10-010-00-024	SPACER, 024	2
6	10-010-00-062	BALL JOINT ROD END	1
7	10-010-00-260	ROD, 260	1
8	10-010-00-261	ROD, 261	1
9	10-010-00-279-R1	BLOCK, 279	2
10	10-010-00-431C-R1	FRAME DRIVE ARM	1
11	10-010-00-433B-R1	ASSY, TENSIONING WHEEL	1
12	10-010-00-434B-R1	ASSY, IDLER WHEEL	2
13	10-010-52-022	TUBE, BOW FRAME	2
14	10-010-52-030-R1	PLATE, 030-R1	1
15	10-010-52-030B-R1	PLATE, 030B-R1	1
16	10-010-52-031-R1	PLATE, 031	2
17	10-010-52-031B-R1	PLATE, 031B	2
18	10-010-52-032-R1	PLATE, 032-R1	4
19	10-010-52-034	PLATE, 034	1
20	10-010-52-038	PLATE, 038	2
21	10-010-52-039	BAR, 039	4
22	H10-071-200	DWS FEED CONTROL UNIT	1
23	1860A032	WASHER 1/2", PH 17-4	1
24	90145A539	1/4 x 5/8 LG. DOWEL PIN	44
25	90298A712	SHOULDER SCREW 3/8"-16 x 1" LG, SS	2
26	91287A375	HHCS M10 x 1.5, 45mm LG, SS	5
27	91831A127	LOCKNUT 3/8"-16, SS	56
28	91831A137	LOCKNUT 1/2"-13, SS	2
29	92196A541	SHCS 1/4"-20 x 7/8" LG, SS	2
30	92198A628	HHCS 3/8"-16x1.5"LG, SS	10
31	92198A641	HHCS 3/8"-16x4.25"LG, SS	2
32	92198A753	HHCS 1/2"-13x3.75" LG, SS	2
33	92210A624	FSHCS 3/8"-16x1"LG	4
34	92240A625	HHCS 3/8"-16x 1-1/8"LG, SS	60
35	93475A280	WASHER 10mm, SS	12
36	98017A199	3/8" WASHER, SS	132
37	98017A209	1/2 WASHER, SS	6
38	92240A714	HHCS 1/2"-13 x 1.25" LG	2
39	Parker 16_C5OX-SS	ORB TO JIC ELBOW	1
40	Parker 16-20_C5OX-SS	ORB TO JIC ELBOW	1
41	Garlock 08FDU06	BUSHING	4

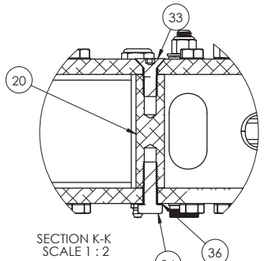
DETAIL A
SCALE 1 : 1



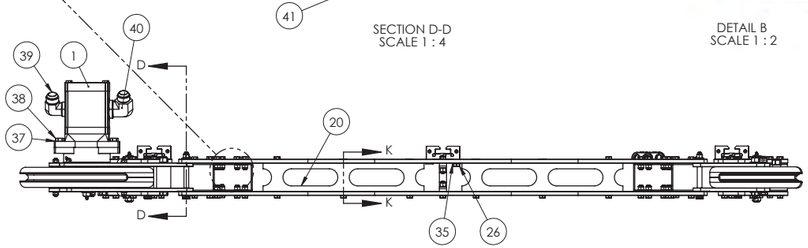
SECTION D-D
SCALE 1 : 4

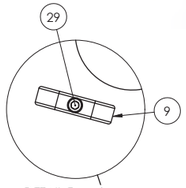


DETAIL B
SCALE 1 : 2

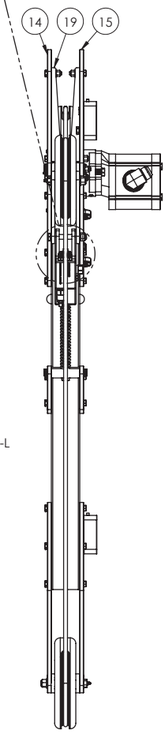


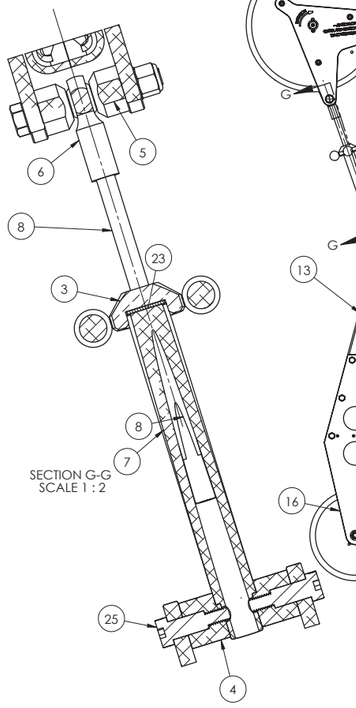
SECTION K-K
SCALE 1 : 2



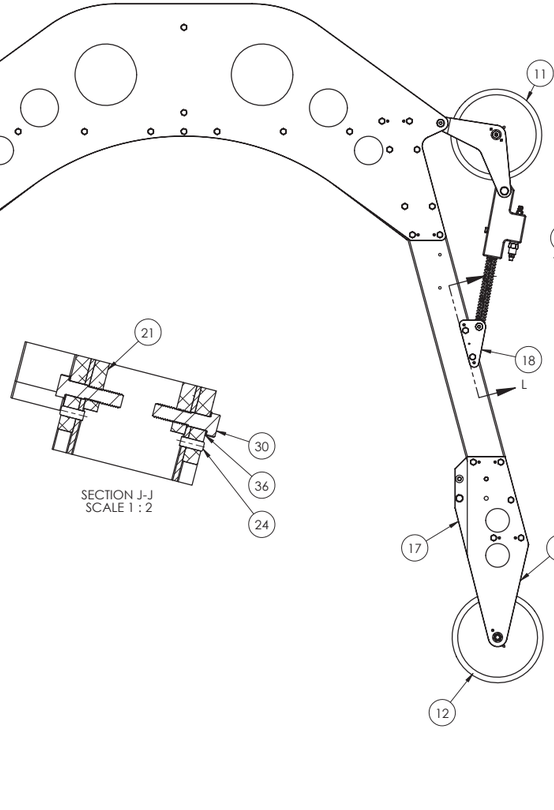


DETAIL F
SCALE 1 : 2



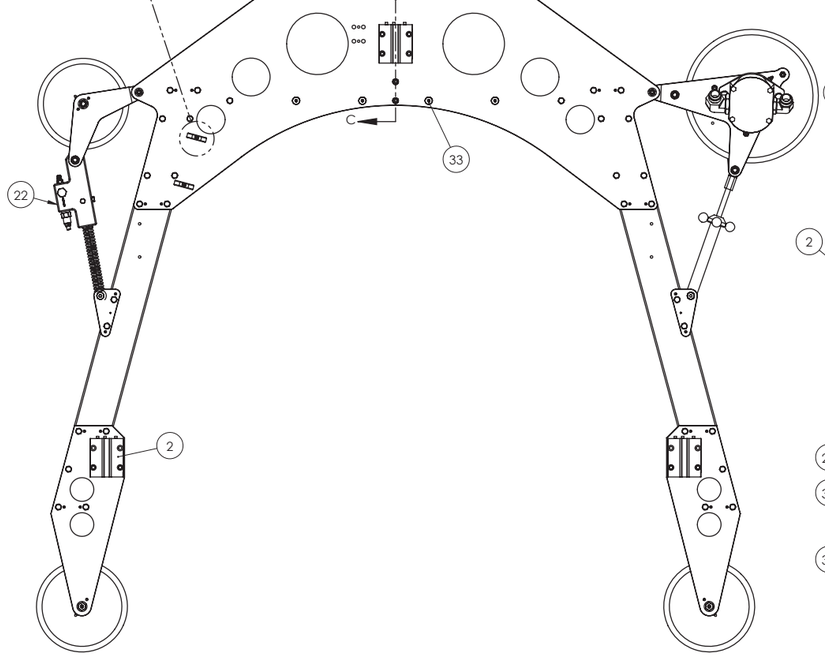


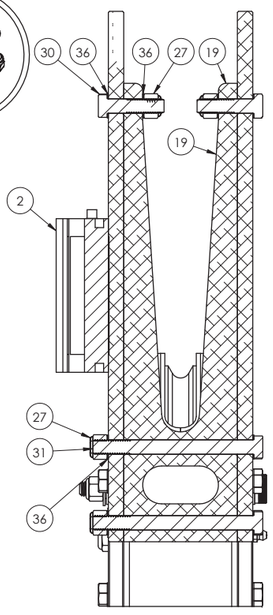
SECTION G-G
SCALE 1 : 2



SECTION J-J
SCALE 1 : 2

SECTION L-L





SECTION C-C
SCALE 1 : 2

REV.	DESCRIPTION	DATE	APR.
2	UPDATE TO R1	10/30/2014	Karl K
1	PRODUCTION RELEASE	1/6/2010	AG

REVISION HISTORY

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TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
ANGULAR ±15 MIN.

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600 Knightsbridge Parkway
Lincolnshire, IL 60069
www.ehwachs.com

TITLE: WS-5230 BOW

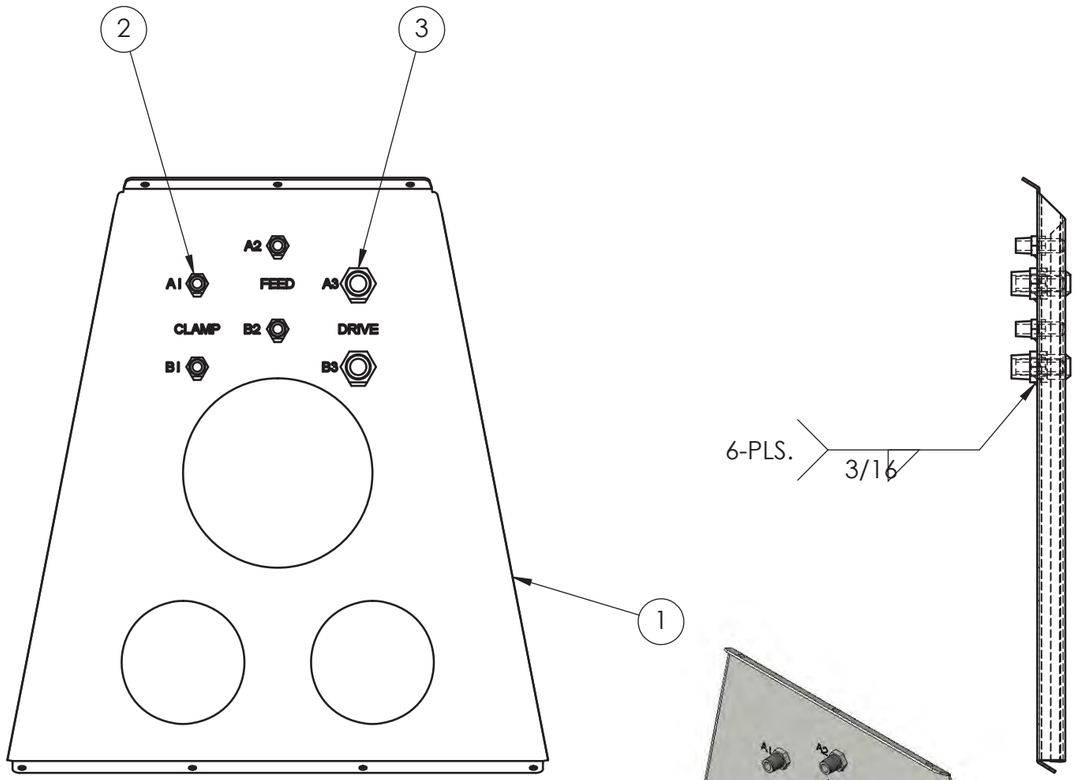
DRAWN BY	APPROVED BY	SCALE
AG	.	1:8
DATE	DATE	SHEET
1/6/10	.	1 OF 1

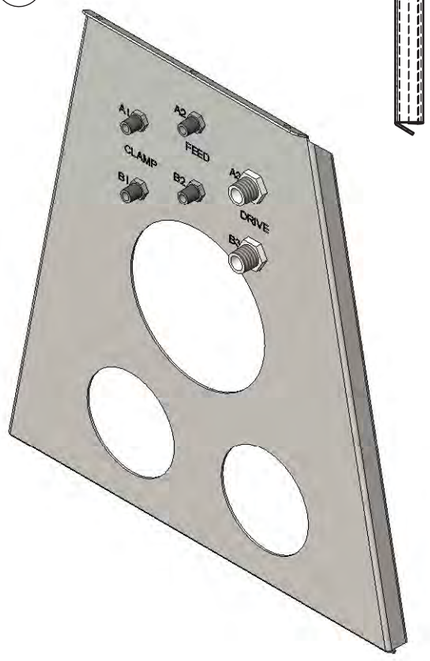
SIZE: D | DWG. NO: 10-010-52-430-R1 | REV: 2

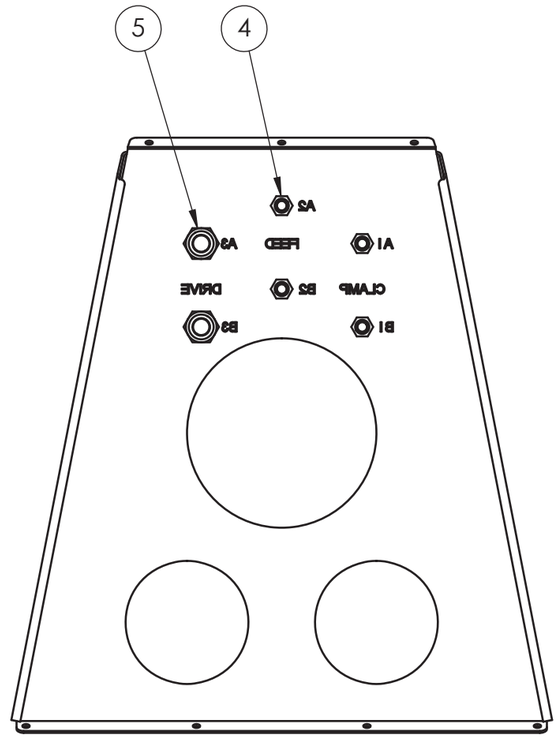
ASSEMBLY NOTE:

ALIGN BULKHEAD FITTINGS AS SHOWN, AND TIGHTLY FASTEN BEFORE WELDING.

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10-010-52-224	PLATE, BULKHEAD	1
2	Brennan 2706-08-08	MP-MJ BULKHEAD STRAIGHT	4
3	Brennan 2706-16-16	MP-MJ BULKHEAD STRAIGHT	2
4	Brennan 0306-08	NUT, BULKHEAD	4
5	Brennan 0306-16	NUT, BULKHEAD	2







REV.	DESCRIPTION	DATE	APR.
1	PRODUCTION RELEASE	12/7/09	AG

REVISION HISTORY

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Lincolnshire, IL 60069
www.ehwachs.com

TITLE: WELDMENT, BULKHEAD PLATE

DRAWN BY	APPROVED BY	SCALE
MWG	KRP	1:8
DATE: 2-25-09	DATE: Date	SHEET: 1 OF 1

SIZE	DWG. NO.	REV.
B	**10-010-52-224B**	1